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BEVERAGE & FOOD WORLD

ANNUAL NUMBER

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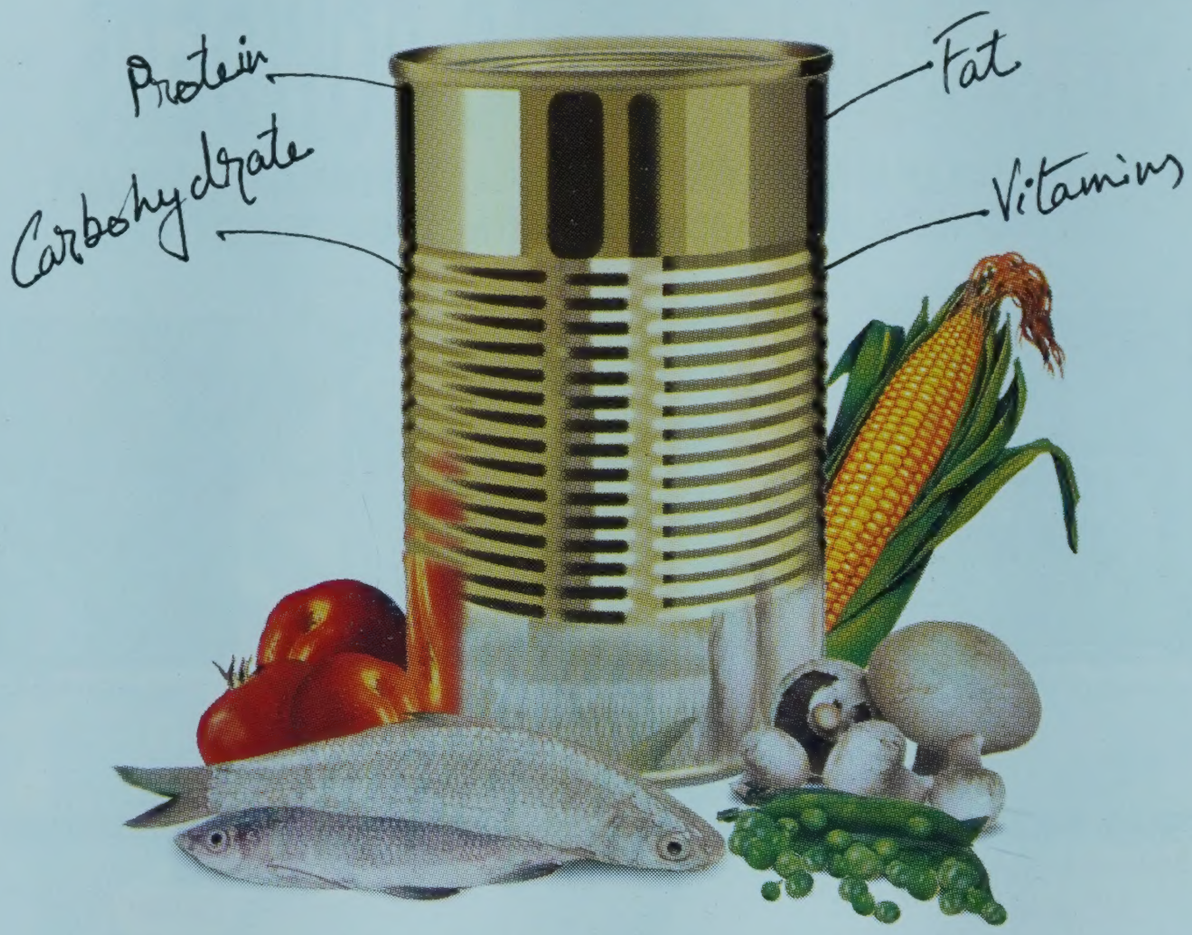

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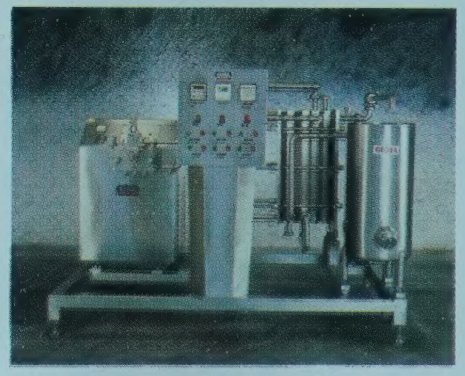

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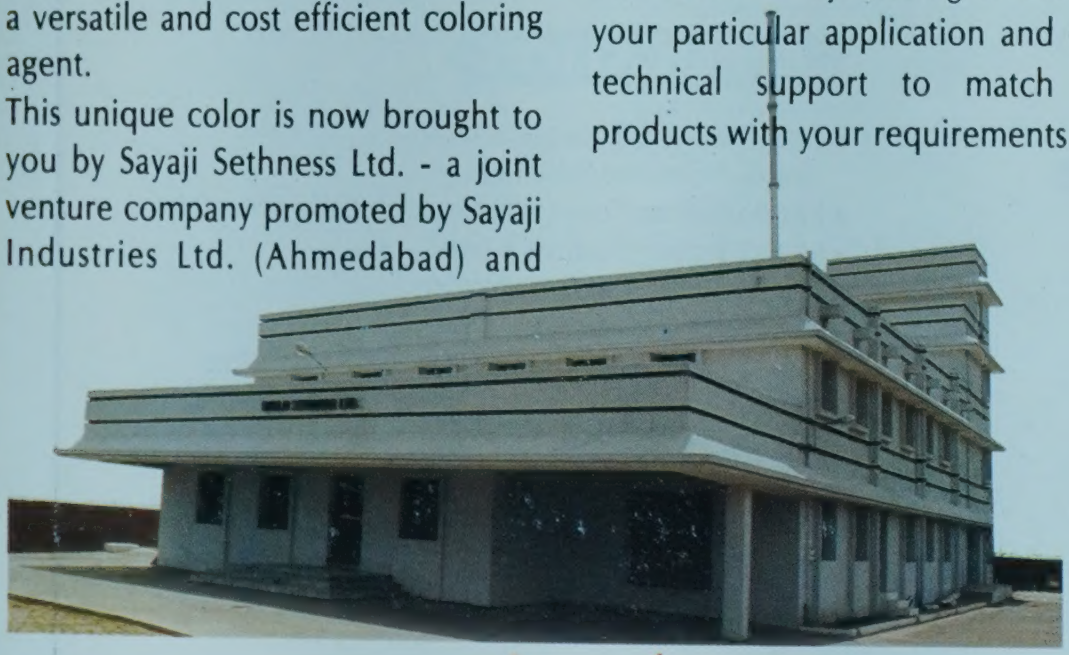

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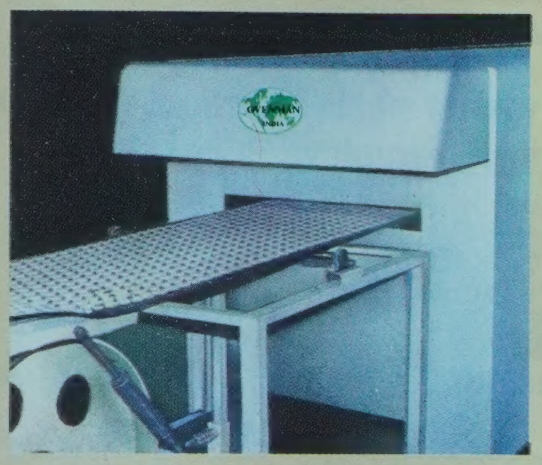
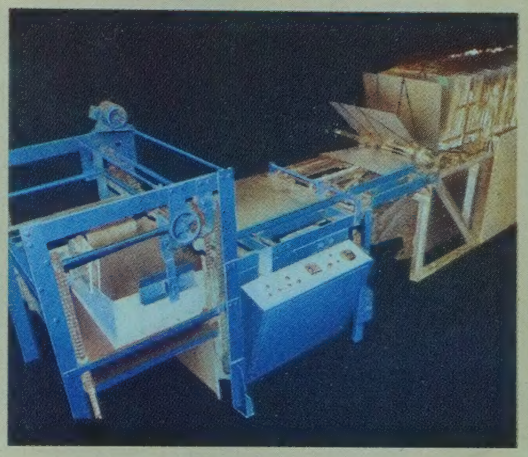


BISCUIT BAKING OVEN

BREAD BAKING OVEN



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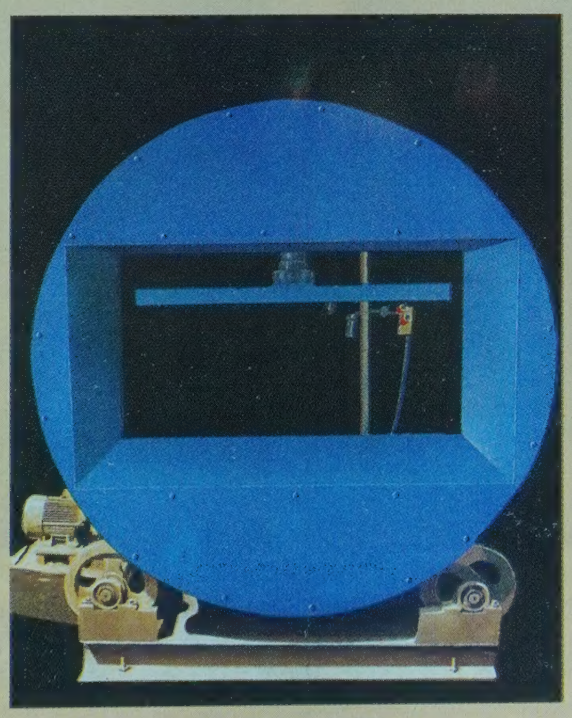

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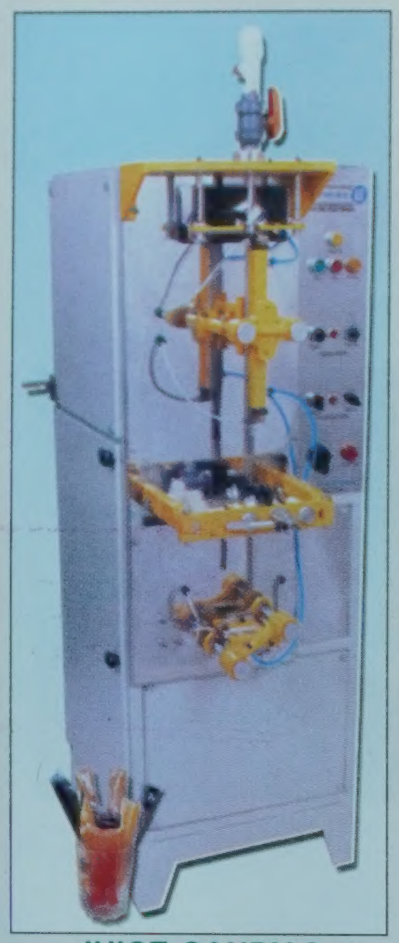

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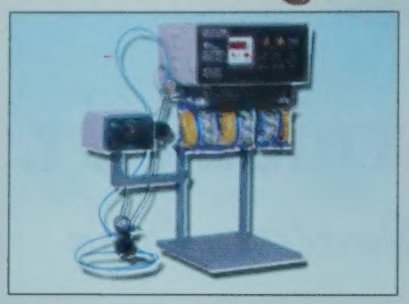

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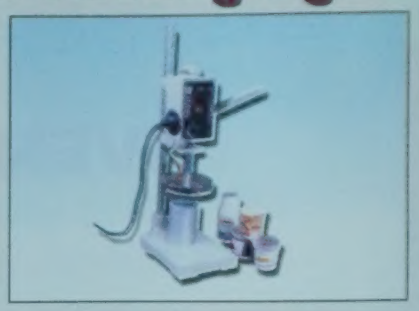

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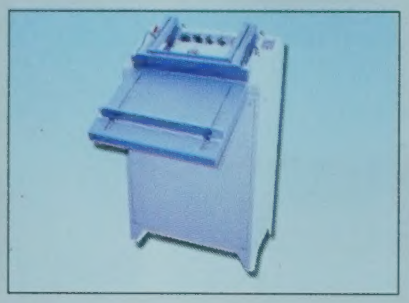

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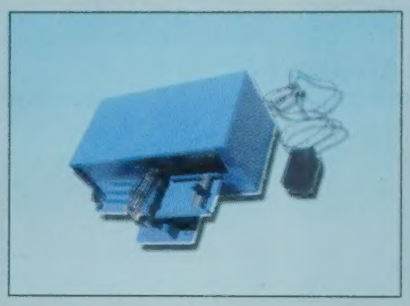

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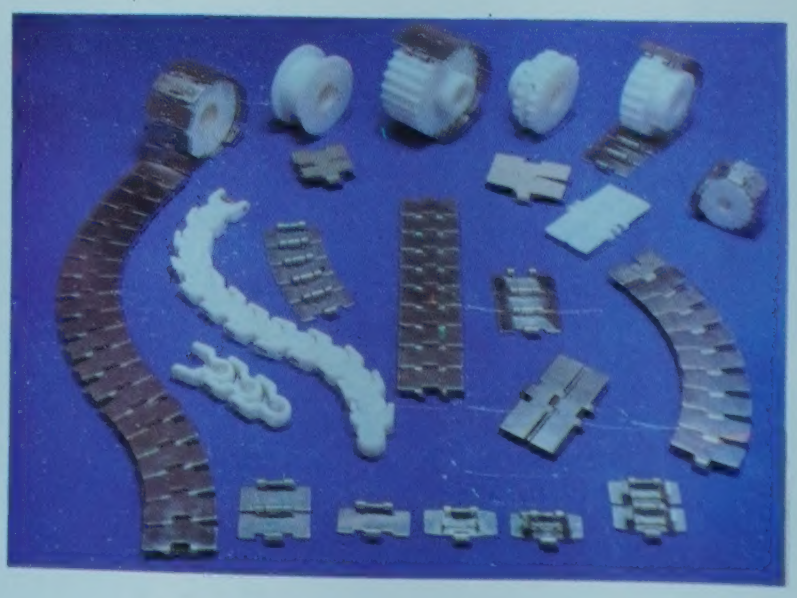

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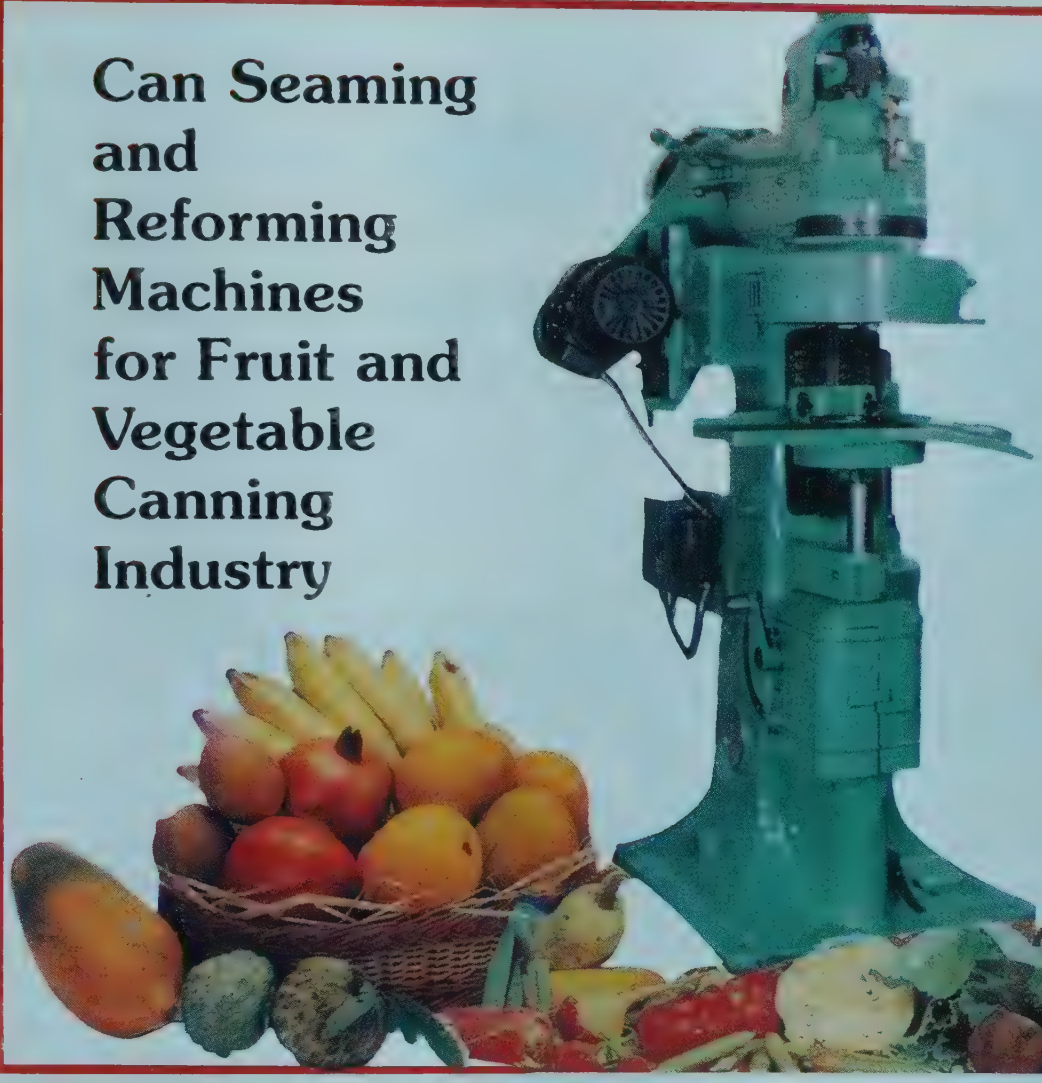

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- Washer type offers easy insertion and removal of filter pads

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Editorial...

High taxation rates including sales taxes and octroi and the multiplicity of laws and agencies are the main reasons for the present state of the food processing sector industries. Omesh Saigal, secretary to the department of food processing industries (DFPI) said recently that the ministry was proposing to enact a Processing Food Development Act which will be developmental rather than regulatory" by nature, and which proposes to define standards for uniform and universal application, merit goods for incentives, creation of development fund dedicated to the food processing industries and creation of equalisation fund as cushion for price fluctuations. The act will also incorporate futures trading and new technologies in packaging, processing and fortification.

As we settle into the new millennium, we see Asia emerging from the economic and financial crisis that threatened a meltdown of the global market. As the economies move on track, spending on food and beverage are set for substantial growth. The basic demand for food will give way to differential needs for quality, variety and innovation.

McKinsey & Co., the consultancy organisation, has conducted studies on the potential of the food processing industry, which highlight the enormous potential in India. Besides a national advantage in this industry, the growth and development in its economy and raised living standards, the impact of higher incomes on food consumption patterns, is assuming new importance. With increasing disposable income of the emerging middleclass and increase in the number of women in the work force, the industry is showing steady growth. The report conducted by McKinsey project food production in India to double in the next 10 years while consumption of value added processed food to treble to US$ 62,500 million by the year 2005.

Food processing industry offers excellent opportunities for innovations and development with respect to packaging materials, methods and machinery. Preservation technologies alongwith suitable packaging materials and systems, have made it possible to introduce new generation products into the market. In the present era of consumerism super markets and electronic media, packaging has assumed a multifunctional role, by serving as a symbol of value addition, an assurance on quality and quantity; a conveyor of convenience and ultimately a marketing tool.

Since international markets have become demanding in terms of quality, safety and delivery, installation of quality systems in food industry would provide competitive edge to food supplies in the international market. Two systems, ***ISO 9000*** and **HAZARD ANALYSIS CRITICAL CONTROL POINTS (HACCP)** are vital for management of quality and safety of food to assure customers around the world. The concept of 'Good Manufacturing Processes' (GMP) also need to be inculcated in the minds of the processing units.

The UN food and Agricultural Organisation (FAO) will provide assistance to the tune of US$ 2,68,000 to India for strengthening the National Codex Committee to facilitate standardisation of food products conforming to international norms. The Codex standards have become critical in international trade of food products under the sanitary and phyto-sanitary measures listed in the new world trade order.

✍ **Editor**

New Concepts in Promotion and Market Development of Milk and Milk Products - Indian Experience*

by
N. Selvanarayanan

The growth of the Dairy Industry in India is both phenomenal as well as lackadaisical. Phenomenal - since we are already the largest milk producers in the world. Lackadaisical - since the per-capita consumption as well as production is way below international standards. This has a manifold effect on the efforts required to handle and profitably dispose any surplus production. The emphasis is on profitable disposal; else the industry may well be heading towards losses as the surplus builds.

Similarly, there is a wide gap in the per-capita consumption of milk. Direct drinking of milk, use as a whitener and for curd, form the major consumption patterns. There is enough and more scope for milk to form a part of the daily food in other food forms. The process of increasing the per-capita consumption is going to be much slower than the rate at which the production is growing.

Unlike western herd/parlor systems, we are today faced with a wide spread and lower animal holding pattern per milking family who are unable to individually invest in technology to increase the productivity at the farm level. We are also constrained to manage a system that cannot ensure collection of very high quality of the raw material. Whereas value addition requires a **high quality of the raw material - MILK.**

The need therefore is clearly to refocus attention to **clean milk production**. Testing parameters are to shift from not just Fat & SNF to **microbiology** - the system of collection also needs to be re-looked at. If investment in bulk milk coolers as well as parlors is possible, **community milking** could be seen as a solution to improving the raw milk quality.

The sheer size of India has also been an impediment for seeing the growth of more number of National brands. The industry, which essentially sells most part of the milk produced, as milk itself, is organized on a regional basis. There are more state level brands specializing in milk only. Government (albeit political) interference today retards the growth of a potentially profitable industry.

The basic lacunae is that, in most dairies, **the responsibility ends at the gate of the dairy.** The channel of Milk agents are expected to deliver all the rest of the marketing functions.

There is an urgent need for a paradigm shift in the **attitude as well as work culture.** The single and most important element for change will have to be the attitude and **vision of the management.**

Orientation of the staff will have to shift from being table oriented to field oriented. Concentration of authority/decision making will have to be delegated to the requisite level of delegation of responsibility. I say so because, responsibility to deliver without the authority to decide in the given circumstances, is a mockery on such delegation of responsibility, which cannot be delivered.

Packaging needs to deliver more value than the mere product. When I say packaging it is not just the packing material. You need to address the whole gamut of the thought process that the **customer** goes through in his or her **decision to buy a product or service.** Today you are faced with an ever growing breed of educated customer with information being updated on a daily basis. The essential issues therefore are :

- **Quality** - Customers are willing to pay more for a guaranteed quality.
- **Utility** - What does your product deliver better than others - Health, Hygiene, Variety, Convenience
- **Excitement** - What extra does your product deliver
- **Status** - What does it say about the customer. Does the customer benefit a status in society by your product.
- **Time** - Ease of availability and time required to decide to buy.

The essential elements therefore become:

Appealing packaging

Given the choice of a range of competing range of products, the customer today has the luxury of choosing the product. The presentation of the product is therefore important. How appealing is your product presentation?

Branding

Branding has to shift from technical classification to relate the product to its natural end usage. The brand or sub-branding with end use suggestion such as LOW FAT, LOW CALORIE, PURE VEGETARIAN, DIET MILK, DIABETIC MILK, SCHOOL MILK makes it easier for the customer to choose the product for a specific use than calling it by technical nomenclature such as TONED MILK, PASTEURISED, STERILISED and the sort.

Avoid technical details in branding which a vast majority of consumers may not understand.

Value Addition

Does your product deliver any additional value than the other product on the shelf. Value addition in terms of fortification, shelf life, pack size, door delivery, lends more value for money to the customer.

Positioning

While you may have taken care of all the key points mentioned above, whom are you talking to? And does the pack suggest such a customer? The pack design and graphics will also have to attract the child / youth / middle aged male / female to whom the product is targeted.

Positioning also involves telling something that nobody has said before. The simple reason is that nothing registers better in the mind slot than a message given for the first time. **The first is always remembered, the second is normally not known.**

This calls for a **shift in the approach** itself. The need of the hour is to **orient towards the customer**. Table work needs to shift to fieldwork. Systems will have to be in place for reducing the time taken to address the customer. Networking and use of the hardware as well as software systems to facilitate instant communication, information and decision making will help in improving efficiency. This

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** This paper was presented at the 2nd IDFT Expo 2000 held in Delhi (3rd-6th October 2000)*

also will reduce duplication, delay and pave way for reduction in manual documentation and consequent reduction in manpower — a long-term savings in recurring costs.

Coming to physical operations, as mentioned earlier there is a **shortsighted approach to the distribution system**. The channel that caters to the milk industry today by and large is restricted to pre-dominantly early morning operators. Most of these are part-time and operate from pavements and disappear after 7 AM.

The sale after the wee hours is dominated by the unorganized and the private sector. The opportunity therefore lies in looking at alternative channels. The possibilities are :

- Transporter - Cum - Distributor
- Day Counters
- Institutional suppliers
- Highway sales agencies
- Early Morning operators
- Bakeries and Confectionery sellers
- 24 hour outlets

The list of alternative channels could be more. The caution in selecting the channel is that the cost of operating the channel needs to be within a manageable cost so that the **MRP is still tenable**. For instance a tourist will be in a frame of mind to pay more since he has no choice. A regular customer is not under such constraint and can look for alternatives.

For operating any or all of these channels there is a cost. The channel members need remuneration commensurate to their effort. **No business can succeed without a positive contribution.** There has to be a contribution, however small it may be, for all the channel members including the producer.

MRP = VARIABLE COST + FIXED COST + PROFIT

Fixed cost is at actuals. **The formula is that Fixed cost + Profit has also to be a constant.** For some time i.e. during the launch phase, profit may be negative but with growing volumes, the fixed cost has to come down and the summation of fixed cost per unit and profit has to be positive. If over a reasonable time you are not seeing profits, it is better to not launch the product or if you have already one, close the product. Service motive with a perennial subsidy is an abuse of customer satisfaction. The customer is anyway paying indirectly for your subsidy.

A good product, with value addition and a guarantee for quality has and must succeed. The formula of success then happens to be how? The act of inducing trial is an art. How does a regular buyer of a particular brand get to taste another product of the same category?

There are success stories to learn from. If the decision maker is the parent and the consumer is the child, why not entice the child. Conversely if the product or service can get into the household through the child even if the parent is the decision maker, why not?

NIE of the Times of India is an example. Kellogs is following suit. These are, however, not the end to imagination. Creativity builds the key. Why do you think females are used to sell male brands and vice-versa. Why does an old man attract attention to a product that means much more and beyond.

The essence is in creating curiosity. Build the first purchase. Then the game is to maintain and gain his loyalty. INNOVATE or PERISH

Today with the government getting more and more savvy towards a liberalized economy, the greatest asset will be the human resource. The will to perform is only with a few. How to harness the full potential of these few and to build incentives to retain these performers is the latest challenge industries are facing today.

A 10 % exodus almost kills a company. (One example could be HMT). The name of the game is :

- Don't let your best talent to get away
- Identify talent in the industry and bring them in
- Build the rest in the team to be satisfied performers
- Treat the whole team as a family (whole heartedly)
- Lead from the front
- Be an example
- The rest is History (INFOSYYS, RELIANCE, WIPRO, NIRMA, SCYCAMORE, HLL .....)

I leave you to some more thoughts on a small yet significantly successful brand in milk.

G o o d l i f e - Pure Cows Milk.

The elements of success have been - Branding, Positioning, Communication, Sampling and Promotion. Very little of media effort.

The latest in marketing parlance is **Direct Marketing**. The latest tool though insignificant today is **E-COMMERCE**. People who invest in creating a direct marketing approach today can expect to reap the benefit over 5 to 10 years. The catch is in tracking the customer. **Business intelligence** is the key. With more and more competition coming up the street, the channel members are going to shift more rapidly. The choice of any channel member will be dependent only on R.O.I. How then can a producer keep his customer with himself.

Creating a database, addressing and meeting the consumers aspirations, servicing at his doorstep is the game plan of the business intelligence that enables you to add value to the product whereby there is lesser scope for another brand to replace yours.

The retail chain is yet another phenomenon to watch. Elsewhere in the world like in UK and France to take an example, the chains have virtually taken monopoly of the retail function. In India it is going to be far more difficult because of the sheer size and the vast network of a traditional small retailing system. The effect is likely to be more on organized markets in the metros and class I cities than the rural and suburban markets.

To sum up - the analysis of a trend that is expected to change the way traditional pundits would have advocated in marketing or the sales function, the catch is in just being there.

Aim at being available everywhere, at an affordable cost, with a product as fresh as possible. People are important. Develop the right talent.

A Business succeeds
Not because it is big
Or
Because it has been long established
But
Because there are people in it
Who breathe it,
live it
dream it
And
Build great future plans for it.

Applications of Rheology to Polysaccharide Gums used as Food Stabiliser and Thickener

by
N. K. Mathur* and Vandana Mathur

Introduction

Any material body, when subjected to an external stress, undergoes deformation. In case of most solids, deformation disappears as soon as stress is removed (ideal elastic solid), while in case of liquids, under permanent external stress, a flow commences, resulting in an irreversible deformation. A third category of material is mouldable solids, which do not recover original shape when stress is removed; hence these can be moulded into a desired shape. Rheology is the science, which deals with the study of the flow of liquids and deformation of mouldable or plastic solids. Viscosity is a measurable property of fluids, which determines the ease with which it flows. This is one property, which can provide important product dimension to a process control engineer. From viscosity value, it is possible to predict pourablity, dip coating, brushing like operations in a system.

Who needs Rheological Information?

Rheological studies are necessary for industries concerned with manufacturing adhesives and sealants, cosmetics and pharmaceuticals, food, paints and coatings, inks, asphalt, plastics and polymers, slurries and suspensions, petroleum products, petroleum drilling and recovery, solutions, gels and gums. Rheological studies help in determining behavioural and predictive information for making formulations and in quality control process. It is possible to create a mathematical model for rheological behaviour of a product and co-relate it to process parameter. This article, though basically concerned with rheology of polysaccharides, used in food, shall also be useful for those interested in basic concepts of this subject and applications concerned with industries, referred to above.

Rheological data pertaining to thickeners or gums being used in a food industry provide useful information for proper selection and use of gums. Gums or the polysaccharides get hydrated in water medium and thicken them or some times gel. Each gum has its own special properties, based on its molecular structure. A discerning scientist, based on rheological parameters of a polysaccharide can make appropriate choice of a gum in specific application and sometimes economise process by using an alternate and cheaper product.

Theoretical Considerations

Stress is mathematically defined as the force divided by the area on which it acts, i.e. Stress (τ)= Force(F)/Area (A),

In case of ideal elastic solids, strain produced can be either tension or compression. In case of liquids, when tangential stress is applied, a shearing strain is produced, resulting in a permanent deformation during a flow motion.

It is presumed that during a flow, an infinitely thin layer of liquid, in direct contact with the container wall, say the walls of a smooth, cylindrical tube, remains stationary, while successive layers further and further away from the wall move with increasing velocity. During gliding of concentric layers of liquid pass each other, in a cylindrical tube, molecular friction results in variation of velocity of successive layers of the liquid. This friction between the molecules of successive layers in a liquid, is a measure of viscosity. For defining viscosity mathematically, we imagine two rectangular, parallel layers of a liquid of area 'A', separated by an infinitesimal distance (dx). On applying a force 'F' tangentially, the upper layer moves with a velocity 'dv', while the lower layer is stationary. Then-

$F/A = \eta dv/dx$

Or, $\tau/s = \eta$

Where 'η' is the viscosity of the liquid.
The term dv/dx represents velocity gradient or shear rate (s). The unit of shear rate is 'reciprocal second' ($second^{-1}$), while considering the unit of force as dynes/sq.cm, the unit of viscosity works out to be 'dynes per sq.cm per sec.', also called 'poise'. In case of liquids with low viscosity the unit employed is 'centipoise'.

Strain produced by any stress, which can be tension or compression in case of elastic solids, or shear strain in case of a liquid, is expressed relative to the original size/shape of the body. The study of the change in the shape and flow of matter, embracing elasticity, viscosity and plasticity are included in rheological study.

Rheological Studies of Gels

Whereas the thickening properties of polysaccharides are evaluated by viscometric measurements; self-supporting gels are evaluated using compression tests to determine the rigidity modulus. Rigidity modulus is an equivalent of Young's modulus of elasticity of elastic solids. Thus when a stress (τ) arising due to a force 'F' acting on a gel of area 'A', produce a compression of 'ΔL' and the original thickness of the gel is 'L', then strain (s) produced shall be '$\Delta L/L$', while the rigidity modulus is expressed as the ratio 'τ/s'.

Thus -

$\tau=F/A=E \times \Delta L/L$, or $E=\tau/s$, where 'E' is the rigidity modulus of a gel.

There is a viscoelastic range limit for rigidity modulus determination and beyond this limit gel gets ruptured permanently. Stress, which causes rupture of the gel, is also an important parameter for food gels.

Temperature of gelation of a gel and the melting temperature of a thermally reversible gel, in an ideal case, should be the same, and these are also important parameters of food gels. Melting of a thermo-reversible gel corresponds to a temperature at which order (generally the helix conformation)-disorder (random coil conformation) transition of polymer molecules takes place. Generally some difference is observed between these two temperatures, and these values indicate the range of temperature under which gel shall have an acceptable texture, without becoming too hard or too soft. Since order-disorder conformation is accompanied by enthalpy change, differential-scanning calorimetric measurement is used in study of food and other gels.

Between colloidal macromolecular sol and a gel many intermediate systems can exist. Thus there can be a

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thixotropic fluid state and a weak gel. Rheology of such system is even more difficult to study. Elastic gels, with melting/softening temperature well above ambient temperature are preferred in food.

Newtonian Fluids

The relation between viscosity, stress and shear as discussed above, shows that shear rate is directly proportional to the shearing stress, while the viscosity is independent of shear stress. Most of the liquids and solutions of low molecular weight substances, which obey above relation, are referred as Newtonian fluids. Viscosity measurements on a fluid can be made using an instrument, which provides variable shear rate, by changing shear stress e.g. Brookfield Viscometer. If the viscosity value in such a measurement comes to be the same at different shear rates, then it can be presumed to be a Newtonian fluid.

In real practice we come across many fluids which deviate, from Newtonian flow behaviour, which are called non-Newtonian fluids. In most cases, with increasing shear rate, the viscosity is found to decrease. Such fluids are referred to as 'pseudoplastic' or 'shear thinning'. However fluids with rheological behaviour other than pseudoplastic are also known.

Instruments for Rheological Measurements

A very simple, pipette type, Ostwald Viscometer or its modified Ubbelohde version can be used for viscosity measurements of simple liquids and solutions. At very low concentration range, Non-Newtonian fluids do not exhibit shear-thinning behaviour. In such cases viscosity measurements are useful in determining molecular weight of polymeric substances, which can be dissolved in a solvent, water being a suitable solvent for most of the polysaccharides.

In real practice when dealing with thickened, non-Newtonian industrial systems rotatory viscometer and programmable rheometer (Brookfield, Haake, Hercules, Ferrantir-Shirley, Fan etc.) are used and give values, which are 'apparent viscosity' at a given shear rate. Commercial gel strength measuring instruments are also available. Additionally gels are also studied using calorimetric measurements and optical rotary dispersion studies in cases involving helix-coil interconversion.

Pseudoplastic or Shear-thinning Fluids

These are the solutions of polymeric materials including those of polysaccharides in water. Being large in size the internal friction between the polymer molecules is high and they thicken the aqueous solution even at relatively low concentration. Due to strong hydration, polymer molecules also produce friction against stationary water clusters and show high viscosity. Polymeric molecules with extensive branching i.e. those having branch on branch, have a bush like spheroid structure. On gyrating they sweep out a much smaller volume and the frequency of their collision with other molecules is low. In contrast a linear molecule of same size, when gyrating in an extended form sweep a much larger sphere and collide with other molecules more frequently, producing much higher viscosity.

Completely linear, homo-polysaccharides e.g. starch-amylose and cellulose, are numerically, far less common in plants compared to numerous, linear hetero-polysaccharide molecules, grafted with numerous short side chains of one or two glycosyl units. Complete uniformity of structure in case of linear homo-polysaccharides can make them fit in a crystalline form, with low or no water solubility. In a stationary solution, linear polymer molecules have a tendency to form helical structure or to exist in a random coil conformation. In dilute solution, where the random coil molecules do not overlap, their solutions exhibit, colligative properties of dilute solution. In such a case a double logarithimic plot of their zero shear viscosity, against concentration multiplied by intrinsic viscosity, show a general pattern of thickening, suggesting that on normalising molecular weight, the polysaccharides can be used interchangeably to obtain the same thickening.

On increasing concentration a break is seen in such a plot, which corresponds to transition from dilute solution behaviour to concentrated solution behaviour. Generally from this concentration onward, a transition is also observed from Newtonian to non-Newtonian flow behaviour.

On shearing they flow in the direction of the shearing force and in doing so, random coil opens up into an extended conformation. The linear molecules tend to orient in the direction of flow and parallel to each other. This results in lowering of the internal friction and hence the viscosity. When the shearing stress is withdrawn, the viscosity in such fluids, immediately attains its original higher value i.e. the change of viscosity is not time dependent.

Plastic Fluids

These are the fluids, which in a static condition behave like a solid or a gel and do not flow at very low shear. On increasing shear stress to a higher critical value called the 'yield value' they begin to flow and then onward they behave like normal pseudo-plastic fluids. A typical example is that of tomato ketchup in a bottle. Often it does not flow out of the bottle unless the bottle is shaken or tapped to over come yield value, but then onward it flows like a normal pseudo-plastic fluid.

Laminar and Turbulent Flow

Depending upon certain factors, there is a maximum speed at which layers can glide over each other, without mass transfer between them and such flow is classified as 'smooth or laminar flow'. Beyond this limiting speed, the flow is called 'turbulent flow' and molecules or the particles jump from one layer to another. At such shearing stress it is not possible to study the flow behaviour of fluids. Range of shear rates of some common operations is shown in Table -1

Table-1:
Some common operations and corresponding shear rates

Shearing Operation	Shear Rate (Reciprocal seconds)
Film sag under gravity	0.01-0.1
Brookfield Viscometer	0.1-10
Chewing food/oral evaluation	10-50
Tumbling and pouring	10-100
Home Mixer / paint brush	100-1,000
Warring Blender / spray coating	1,000-10,000

Thixotroic and Rheopexic Fluids

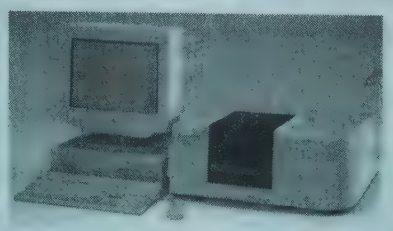
The decreased viscosity of a pseudoplastic fluid attains lower viscosity value, at a given shear rate instantaneously and thereafter remains fixed at that lower value. In certain other cases, at a fixed shear rate a fluid takes certain time to reach the lower viscosity value. Similarly when the shear is withdrawn the fluid takes some time to return to the original higher viscosity. Such fluids, showing time dependent viscosity variation, are called thixotropic fluids.

Linear, solute polymer molecules in a thixotropic fluid, can have some chain-chain association, when the fluid is

Analytical Solutions

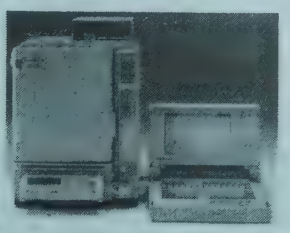
SHIMADZU
UV-1240 UV-VIS
Spectrophotometer

SHIMADZU
UV-1601 Double Beam
UV-VIS Spectrophotometer



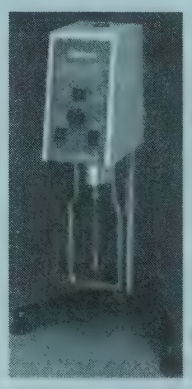
SHIMADZU
FTIR-8300 Fourier Transform
Infrared Spectrophotometer

SHIMADZU
AA-6200 Atomic Absorption
Spectrophotometer

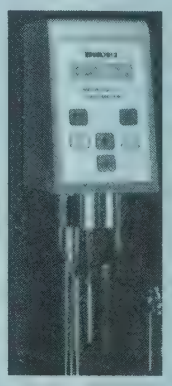


SHIMADZU
GC-14B Series
Gas Chromatograph

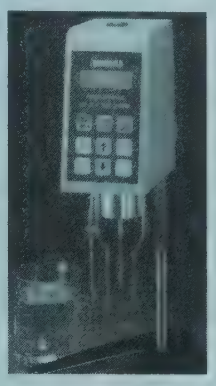
Dial Reading
BROOKFIELD VISCOMETER



DV-E
BROOKFIELD VISCOMETER



Digital DV-I+...
BROOKFIELD VISCOMETER



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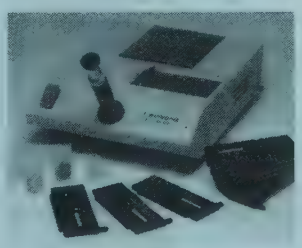

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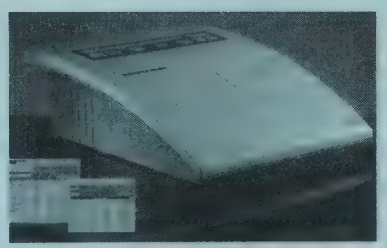

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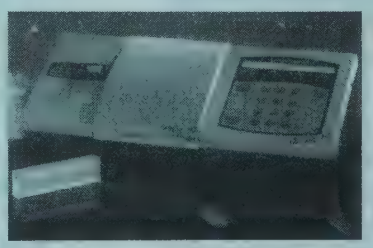

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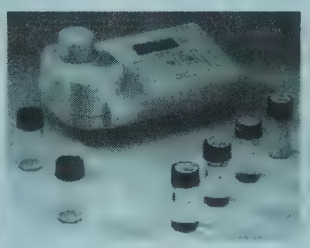

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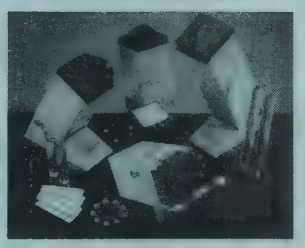

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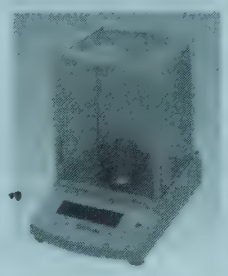

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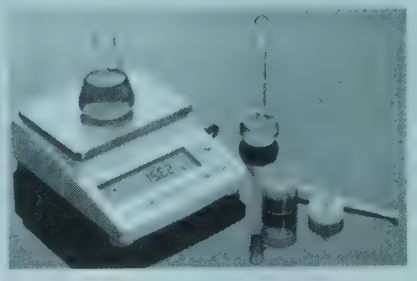

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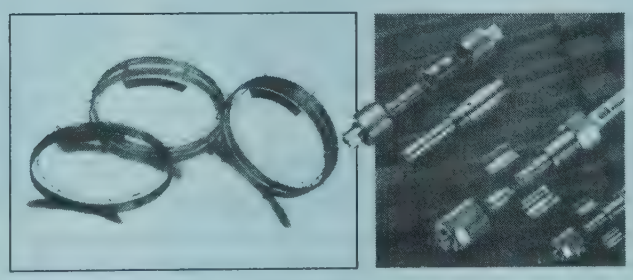

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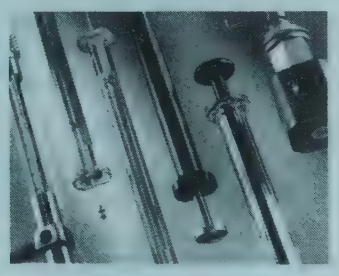

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stationary. These hydrogen bonding type associative forces are stronger than simple coil-coil inter-penetration, yet they are weak enough to get broken off, when a shearing force is applied. This explains the time-dependent lowering of viscosity of thixotropic fluids on shearing.

Non-uniformly substituted linear polymers e.g. carboxymethyl cellulose (CMC), with a medium degree of substitution (DS) and locust bean gum are typical examples of thixotropic fluids. In the latter case relatively large lengths on un-substituted mannan backbone(>20 mannopyranose units) can associate to another bare mannan segment of an adjacent polymer chain to give a rheology of semi-gelling stage. Similarly in case of non-uniformly substituted CMC, unsubstituted glucan segments of the backbone act as gelling centers.

Certain pseudoplastic polymer fluids start exhibiting thixotropic rheology at higher concentration. Thixotropic and pseudo-plastic fluids are preferred in certain applications e.g. in application of paint on a vertical wall. A shear-thinning fluid offers the advantage of becoming thin due to shearing caused by brushing, only to get re-thickened and becoming non-flowing, when brushing stops. The same is true for the shear-thinning rheology of a textile print paste, which re-thickens when shearing due to squeegee is stopped.

Even in food applications, shear-thinning thickeners are preferred, because they produce a better sensory perception in mouth, where medium-low shearing is produced on mixing the food by tongue and the roof of the mouth.

Rheopectic fluids, though rarely encountered, behave just opposite of thixotropic fluids i.e. they increase in viscosity at a constant shear rate with time.

Dilatant Fluids

There is yet another type of fluid, which show behaviour opposite of pseudoplastic materials, i.e. it increases in viscosity at a constant shear rate and hence it is called 'shear-thickening'. Rheological studies indicate that it will be a mistake to attempt pumping of a dilatant fluid, because it can result in shear thickening of the fluid to an extent to block the flow. Dilatant fluids are less common and usually contain high concentration of deflocculated solids e.g. clay slurries, candy compounds and suspended cornstarch Rheological behaviours of different types of fluids discussed above is summarised in Table-2.

Sensory Perception of Food

Common polysaccharides used in food as thickener, stabiliser and as gelling agents, are listed in Table-3, along with their rheological behaviours. Perception of consistency of a thickener in a food mainly depends upon its apparent viscosity. At a given shear rate the perception of consistency is made when food, particularly liquids or semisolids, are subjected to a medium-low shearing (25-27 dynes/sec.), by taking a portion of food on the tip of the tongue and shearing it on the roof of the mouth. The stress produced is registered by the sense organs, situated at the surface of superficial structure of mouth. In case of thickners, with an initial or zero shear viscosity of ~1000cps, and under going shear thinning of less than 400cps, the perception registered is slimy, whereas if the shear thinning is >800cps, it is regarded as non-slimy. Polyelectrolyte type gums e.g. CMC, alginate, and pectins, having an extended coil conformation are less shear thinning and give slimy perception, unless used at very low concentrations. In contrast, gum arabic, corn fiber gum, starch and depolymerised gums, being highly branched, having a low viscosity and Newtonian flow behaviour at considerably high concentrations do not give a slimy perception even when used as bulking agents at a higher concentration.

Table - 3

Gum arabic	Newtonian
Corn or wheat fiber cellulose	Newtonian
Starch	Newtonian
Guar gum	High shear thinning
Locust bean gum	Medium shear thinning
Xanthan	Medium shear thinning
Carrageenan	High shear thinning
CMC	Low shear thinning
Pectin	Low shear thinning
Sodium alginate	Low shear thinning
Methyl cellulose	Low shear thinning

Suitability of typical Food Gums in specific applications based on Rheological Behaviour

Corn starch - General, most widely used and a normal constituent of food, nonionic thickener with Newtonian flow behaviour, show synergy with galactomannan. Gels due to retrogradation on cooling. Source of calories in food.

Corn or wheat fiber gum/hemicellulose - Nonionic, noncaloric, bulking agent, Newtonian flow and good emulsifier.

Gum arabic - Anionic, but same as above

Galactomannan gums, guar and LBG-General low-calorie thickeners, shear thinning, synergistic viscosity enhancement or gelling with xanthan/carrageennan gums.

CMC - General thickener, shear thinning, thixotropic, noncaloric, nongelling, anionic-protein binding.

Xanthan - General thickener, gels in binary system, shear thinning, heat and pH stable, non-caloric, anionic-protein binding.

Carrageennan - General thickener, shear thinning, gels in binary system, non-caloric, strongly anionic - good protein binding.

Sodium alginate - General thickener, shear thinning, cation-mediated gelling. Non-caloric, anionic-protein binding

Pectins - Low and high methoxyl, shear-thinning, cation-mediated or low water activity gelling Non-caloric, anionic-protein binding.

Cation mediated gels, derived from

Table -2 : Types of fluids according to their behaviour on shearing

Nature of fluid	Effect of Shear	Effect on Viscosity	Remark
Newtonian	Nil	Nil	Non-polymeric liquids/ solutions
Non-Newtonian			Polymer solution and melt/emulsions/ suspensions/slurries
Pseudoplastic	Shear-thinning	Decrease	Viscosity change time independent
Thixotropic	Shear-thinning	Decrease	Viscosity change time dependent
Rheopexy	Shear-thickening	Increase	Viscosity change time dependent
[illegible]	Non-flowing at rest	Decrease	Behave like pseudoplastic on exceeding yield value
Dilatant	Shear-thinning Thickens	Increase	Viscosity change time dependent

Contd. on Page 23

Studies on the Suitability of Dried Ber Fruits for Preparation of RTS Beverage

by
Marimuthu, M and Thirumaran, A.S.

Abstract

An attempt was made to dehydrate the 'Umran' ber and process RTS beverage from the dried ber to develop a value added product. Fully mature, slightly ripe, firm fruits of golden yellow to light chocolate brown colour free from insect pests and disease were washed and blanched at 100^0 C for 2-3 minutes. Sulphiting treatment was given (2g/kg of fruits) for 2 hours and dried at 60^0 C in a cabinet tray drier for 40 hours to a final moisture content of 12 percent packed in polyethylene bags and sealed. The chemical analysis showed that except for vitamin C, there was a considerable increase in total and reducing sugar and acidity content of the dried ber. Dried ber was cooked with water and juice was extracted. The RTS beverage was developed with 33.35 per cent juice content, 19.6^0 Brix and 0.56 per cent acidity and double pasteurized and found to have a shelf life of more than nine months without affecting the quality characteristics like colour, flavour, mouthfeel and taste.

Introduction

Ber (*Zizyphus mauritiana* Lamk.) is an indigenous fruit of India. It is considered a poor man's fruit and has been in use since ancient time. Cultivation of ber is becoming increasingly popular in India because of its hard nature, low cost of cultivation and good returns to the farmers (Pareek, 1983). It is also being recognized that ber fruits are not only delicious but are very nutritious also. The fruit is believed to purify blood and help in digestion.

The processing aspect of the ber fruit is receiving some attention now. The fruits are perishable in nature which needs quick disposal and utilization. Very little systematic work has been done on processing of ber fruits. Therefore, to ensure the production and minimize the post harvest losses, there is dire need for exploring the possibilities of utilizing this fruit in the processing industry. Thus, the present investigation was conducted to process ber for preparation of dried ber and its utilization in the preparation of ready-to-serve beverage. The results of such a study is reported in this paper.

Materials and Methods

The matured ber fruits of Umran were obtained from the Regional Research Station, Tamil Nadu Agricultural University at Aruppukkottai. The fruits were washed with water and cleaned thoroughly. The fruits were then blanched in hot water at 100^0 C for 2-3 minutes. Sulphiting was done in a fumigation chamber using 2g sulphur powder per kg fruits for 2 hours. The material was then dried at 60^0 C in tray dryer for 40-48 hours, till the moisture was brought down to about 12%. The dried material was then packed in polyethylene bags and sealed.

Home Science College and Research Institute, Department of Food Science and Nutrition, Tamil Nadu Agricultural University, Madurai - 625104

One kilogram of washed dried ber was cooked with 6 litres of water for 60-80 min. and the cooked mass was extracted through a basket press. The extract was allowed to settle and the clear juice was separated.

Chemical Analysis

Fresh ber fruits, dried ber and RTS beverage were analysed for their chemical composition. The moisture, ash, acidity and ascorbic acid contents were determined by standard AOAC (1975) procedures (Table 1). Reducing and total sugars were estimated by Somogyi Nelson Method (Nelson, 1994). Organoleptic evaluation of RTS beverage was done by a panel of semitrained judges as described by Amerine ***et al*** (1965).

Table 1 : Chemical composition of ber fruits and dried ber

Constituents	*Ber fruits*	*Dried fruits*
Moisture (%)	80.21	12.00
Total sugar (%)	9.96	20.40
Reducing sugar (%)	4.53	14.00
Acidity (%)	0.223	0.61
Ascorbic acid (mg/100g)	95.63	46.44
Ash (%)	0.61	2.80

Results and Discussion

A process for drying of ber fruits has been developed. Khurdiya and Singh (1975) prepared dehydrated ber by exposing blanched fruits to SO_2 by burning sulphur powder @2g/kg fruits for one hour. The fruits were then dried at 60^{0}C for 40 to 80 hours, packed and sealed. This method is less time consuming and requires less sulphur than the method of Khurdiya and Singh (1975). The dehydrated ber can be eaten as is or after being reconstituted in 40 per cent sugar solution. The dried ber can be utilized for preparation of RTS beverage (Table 2). However the colour of the juice was darker, the beverage prepared out of it was found organoleptically acceptable.

Table 2
Composition and organoleptic evaluation of RTS beverage prepared from Dried Ber juice

Ber Juice (ml)	Sugar (g)	Water (ml)	Citric acid (g)	^{0}Brix (20^{0}C)	Acidity (%)	Organoleptic overall score	Quality Rating
100	40	150	0.62	20.0	0.50	7.5	Like moderately
100	40	150	1.22	20.0	0.55	7.0	" "
100	25	160	0.35	15.5	0.36	6.0	Like slightly
100	25	160	0.90	16.0	0.42	5.5	Neither like no dislike.

The juice content in the beverage was 33.3%

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Contd. on Page 23

Steel Cans Preserve, Protect and Provide Convenience

by

Anand Sen*, S.K. Kapoor and Santosh Antony*****

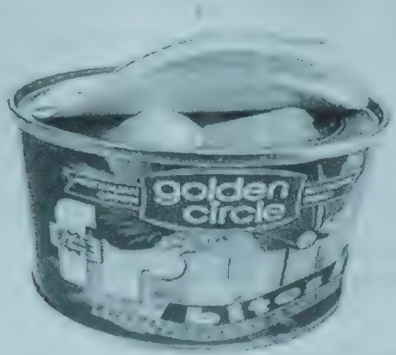
Right from preserving food to serving up a cool beverage, the steel cans have played a pivotal role in the packaging history. Now, nearly 200 years after the invention of canning process, steel can's credentials to environment protection and to the packaging industry is simply unquestionable.

The history of packaging could not be complete without paying deserved tribute to the steel can. In the late 18th century, Napolean's army, which had suffered more from scurvy and malnutrition than by actual combat, offered 12,000 francs, in those days, to anyone who could develop a way to preserve food for the military on the battlefield. A French confectioner, Nicolas Appert, after 15 years of research, took home the prize in 1809. He discovered that the application of heat to food in sealed cans preserved the food from deterioration. After partially cooking the food, sealing it in bottles with tight cork stoppers and immersing the bottles in boiling water, he arrived at the solution - If food is sealed in an airtight container and the air inside is expelled and if the container is then heated sufficiently, the food inside will stay for a long time. A year later, in 1810, an Englishman, Peter Durand, received a patent from King George III for a tin-plated iron can and that replaced the corked bottle.

The hand-made can of the early 19th century has little resemblance to today's metal containers. Can bodies, in those days, were cut and shaped with the side seam and ends soldered together. Food was then inserted in the can through a hole on the top, followed by a tin disk soldered over the hole after evacuating the air inside. An experienced workman could manufacture six cans per hour.

Today, about 410 billion cans are produced in the world each year, with about 221 billion sold to soft drink companies to the food packaging and general line applications.

Global consolidation in the can making industry has centered production within a handful of companies and only a few major food companies, such as Nestle, Heinz and Seneca still produce their own cans. Increasing concern for consumer convenience has changed the cans from chisel hit top to easy ring top opener and pliable top opener cans (see picture)



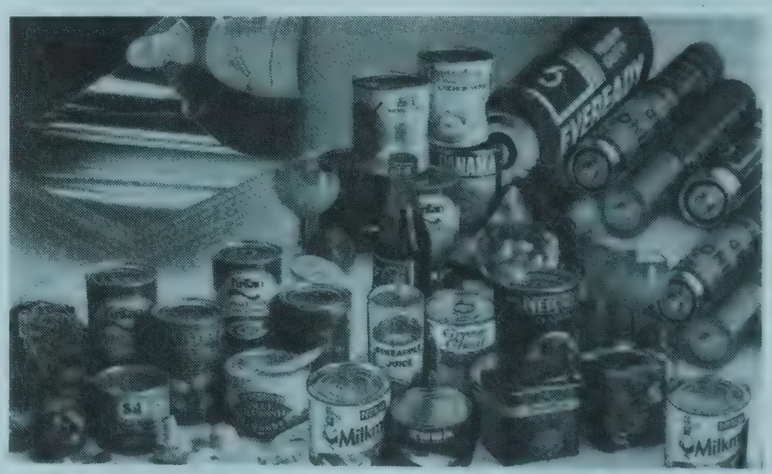
* *Chief of Marketing, Tata Steel*

** *Chief of sales (Coated Products), Tata Steel*

*** *Industry Manager (Tinplate & Packaging), Tata Steel*

Steel cans - journey from blast furnace to the end users

Steel is produced in the Basic Oxygen Steel making Plant using molten iron made in the blast furnace, along with scrap steel and various alloy additions, which are set to yield the required chemistry and metallurgy. The molten steel is then continuously casted into slab form and the slabs are hot-rolled in the Hot Strip Mill into coils of steel strip with a thickness ranging from 1.6 to 2.5 mm. The Hot Rolled Coils are Cold Rolled to final thickness, usually in range of 0.12 to 0.30 mm for food cans and other related applications. The Cold Rolled Coils after reducing the work-hardening effect, through annealing, is fed to the Electrolytic Tinplating line where the tin coating is applied by continuous electro-deposition of tin on to the thin steel strip, after which the tinplate is either sold in coil or cut sheet form to the can manufacturer. In case of Tin Free Steel, chrome coating is applied on the steel strip instead of tin.



At the can manufacturer's end, tinplate is printed with the required labels and information, slitted into body blanks, which are then rolled into a cylindrical shape and the contacting edges welded together at very high speeds. The ends of this cylinder are flanged to the can ends, popularly known as 'Top' and 'Bottom'. Corrugations, known as beads, are often rolled on to the cylinder walls for added strength. The open top can with already seamed bottom is then supplied along with the top cover to the canning company, which after filling and seaming the top, markets the product.

Hard facts of steel packaging

Steel cans provide longest shelf life - a minimum of two years and are best suited for the tropical weather conditions. No other packaging medium offers such a long shelf life for packed food, which makes it the most dependable packaging medium to keep the food in prime condition for relatively longer periods. Steel base of tinplate makes it the most tolerant packaging medium with power to resist insects, germs, bacteria and above all - the ultra-violet light, which helps the food to retain its original aroma and flavour. The strength of steel also makes these cans pilfer proof and undoubtedly, the most robust packaging medium

to withstand the poorest handling and transportation conditions. Besides exhibiting excellent stackabilty and impermeability properties compared to its alternatives, tin cans also offer the best print-ability options compared to all other packaging medium - giving it a premium look on the shelf. The range of coatings and surface finish available in tinplate makes it ideal for a wide range of applications right from food packaging to dry cell jackets, crowns closures, decorative cans and even toys.

Tin cans are 100% degradable, eco-friendly packs, which do not cause any environmental imbalance. Tin cans are totally recyclable - they can be melted for infinite number of times without ever changing the properties of steel. Thanks to it's magnetic property, which makes it the easiest type of packaging material to be collected and sorted for re-melting. Today more than 50% of worldwide steel production is made up of steel scrap, rates of recycling for steel packaging are high and growing steadily in the developed economies. There is a huge saving in recycling the steel scrap. Every ton of scrapped tin cans saves approximately:

- 1.5 ton of Iron ore
- 665 kgs of Coal
- 191 kgs of Limestone

and above all it saves 70% of power consumed in steel making.

Conclusion

The steel can is probably the only packaging medium, which exhibits so many advantages for packaging. It is the most naturally recyclable packaging material - perfectly suited for an age in which commercial success will depend on sound environmental credentials. With the increasing thrust on environment, hygiene and packaging waste management, steel would certainly be a preferred medium for packaging in future, particularly in developing economies like India and China where the life style of the people is changing very fast, resulting in increased consciousness towards packaging.

- Ultra Violet protection
- Barrier properties/Inertness
- High Shelf life
- Eco-friendliness - 100% degradable
- Tamper proof / Impermeability
- Excellent printability

...will ensure continued niche position of tinned and tin free steel in the packaging industry.

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Contd. from Page 18

Applications of Rheology ..... Thickener

alginates and low methoxyl pectins can be non-thermo-reversible and have applications as artificial cherry and bakery or confectionery gels. Anionic polysaccharides are particularly useful in dairy products, because they can bind cationic milk protein, casein and prevent its separation even at acidic pH. Certain blends of polysaccharides produce rheology similar to those of fats, starches and sugar and rheological study has helped in development of their mimics or substitutes.

Conclusion

A practicing food technologist is, generally, not expected to be very well versed with the science and application of rheology to food manufacture. From the extensive information now available in the literature related to industrial polysaccharides and the product literature available from manufacturers/suppliers of food hydrocolloids, it is now easy to make a right choice of a stabiliser/thickener in a particular food. Fortunately user friendly and simple instruments for obtaining useful rheological data are also available, which can help in the right choice of materials, to yield a final food product of predetermined texture and properties.

Contd. from Page 21

Studies on the Suitability.....RTS Beverage

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Physicochemical Characteristics of Different Types of Jaggery and Utilization in Product Formulation

by
Shobha S. and Jamuna Prakash*

Abstract

The physicochemical characteristics of four types of jaggery (three from sugar cane using different manufacturing processes and one from palm) were studied and they were used in preparation of groundnut Chikki, Jaggery samples contained 9 - 12.7% moisture, 0.1-0.6% protein, 08 - 2.0% total ash, 8 - 14 mg calcium, 14-112 mg phosphorus and 2.0 - 7.0 mg iron per 100g. The insoluble matter ranged from 0.5 - 0.7%. Sugar profile was as follows - reducing sugar, 19.6 - 24.3%, total sugar as invert sugar 82.3 - 83.4%, sucrose 56.2 - 59.5% and total sugar 79.1 - 80.4%. The stages of cooking of jaggery were markedly different from that of sugar. The sensory analysis of jaggery chikkis revealed significant differences in comparison with sugar chikkis but between jaggerly chikkis there were no differences. The products could be successfully stored up to 4 weeks with no difference in the sensory quality.

Introduction

Jaggery and sugar are two common sweetening agents used in cookery and in beverages. Jaggery is known from ancient times in India and popularly used as a sweetening agent. The most common source for preparation of jaggery is sugar cane. Other sources like date palm, fan palm, sago palm, coconut palm are also used. Jaggery from these different sources has a different aroma, flavour, colour and texture Usha ***et al.*** (1965). There are different types of manufacturing process used in India for manufacture of cane jaggery. These result in products like cream jaggery, black jaggery and white jaggery (CSIR, 1957). Jaggery is manufactured both in small scale cottage industry in villages and in large organized sectors. Some types of jaggery are used for therapeutic purposes in India. Palm jaggery is said to have many curative properties. Palm jaggery is manufactured from neera tapped from palm trees which has been a poor man's beverage from time immemorial (Mamage and Sohonie, 1966, Rama Rao ***et al.*** 1970). Jaggery is also recommended for its high iron content. Present investigation was undertaken with an objective to study the physicochemical characteristics of different types of jaggery, to use it in a product and to study the sensory quality of prepared products.

Methodology

Materials

Different types of jaggery used for the study were palm jaggery (from palm tree), cream jaggery, white jaggery and black jaggery (from sugar cane). These were bought in one lot for the entire study and stored in airtight containers in refrigerators. Other ingredients used for the study namely cane sugar, ground nuts, refined wheat flour (maida), corn flour, hydrogenated fat and milk powder were also purchased from local market. Cane sugar served as an experimental control for the entire study. The chemicals used for the study were from BDH Chemicals Ltd. and SD Fine Chemicals Ltd., Mumbai. Glass distilled water was used for analysis.

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Chemical Analysis

Different types of jaggery were analysed for proximate principles. The methodologies followed were for moisture, protein (Kjeldahl method) and total ash- AOAC (1984); for calcium, phosphorus and iron - NIN (1984) and for reducing sugars and total sugars - Ranganna (1977). For determination of insoluble matter 5g of jaggery was dissolved in 10ml of water over a water bath and filtered through a pre-weighed filter paper. The filter paper was then dried and weighed. Correction was applied for the weight of the paper. All estimations were done on duplicate samples.

Stages of cooking

Various stages of cooking for four types of jaggery were determined by the following technique- 50g of jaggery was dissolved in 100ml of water in a small vessel and heated. The different stages reached were recorded with the help of a thermometer and further confirmed by cold plate test. The entire experiment was repeated thrice and average value taken. The stages of cooking were also repeated for all samples with the addition of 5g of one of the following ingredients - maida, corn flour, milk powder, and hydrogenated fat. Similar stages were also determined for sugar which served as control.

Preparation of product

The product selected to be prepared with jaggery was a groundnut based candy type of product commonly called as 'Chikki'. Chikkis are prepared both with jaggery and with sugar. The groundnuts were roasted on a low fire till the emission of a fine aroma and separation of red skin. It was cooled and the red skin separated completely. It was powdered coarsely. The proportion of ingredients used were 600g of jaggery/sugar, 300g of groundnuts and 100ml of water. Chikkis made out of palm jaggery and sugar did not require addition of water. Jaggery/sugar was dissolved over fire and cooked till it reached soft ball stage (112-114^{0}C for cane sugar/jaggery, 107-109^{0}C for palm jaggery), groundnuts were added to it and cooked further for 3 min. with vigorous stirring. The whole mass was then transferred to a well greased plate and allowed to cool. After cooling it was cut into square pieces.

Storage of product

Since Chikki is a product which is stored for a long time and consumed, it was thought worthwhile to study the storage characteristics of prepared Chikkis. For pilot trial of the storage study, two types of packaging materials namely, butter paper and cellophane paper were selected. Chikkis prepared with different types of jaggery/sugar were stored in butter paper or cellophane paper. They were wrapped individually in one of the papers, stored in air tight tin and their overall quality was monitored by observation and tasting every 3 days up to 24 days. In all the cases it was found that cellophane paper was able to store the product in a better way in comparison with butter paper. Hence for

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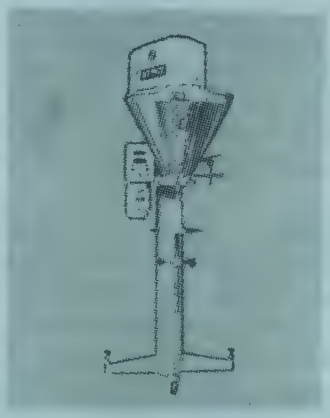

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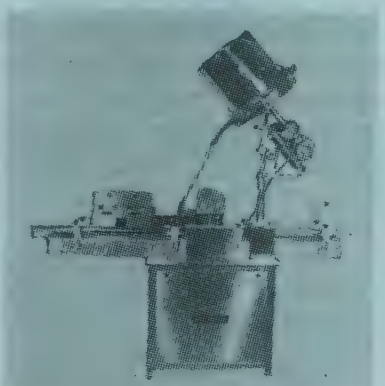

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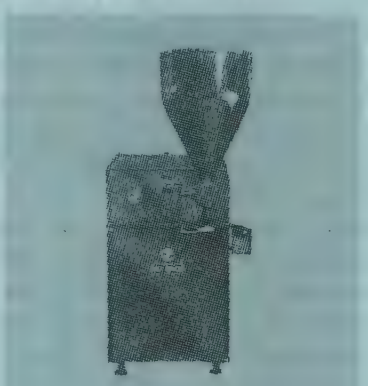

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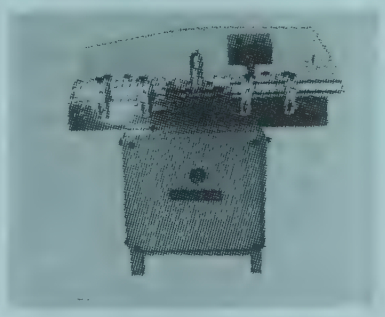

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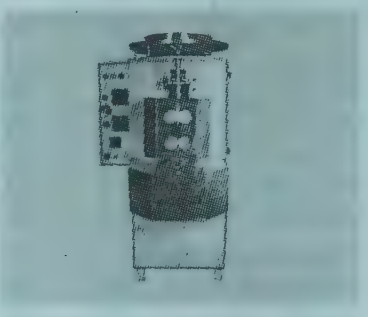

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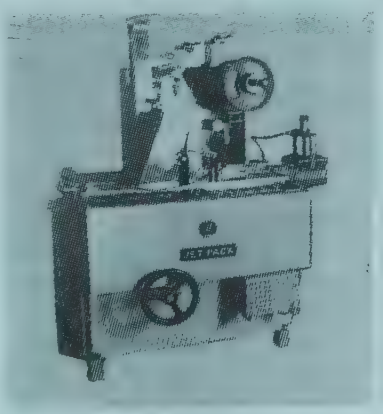

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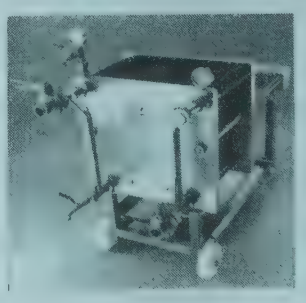

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the actual study the products were individually wrapped in cellophane paper, stored in air tight tin and kept at room temperature for a period of one month.

Sensory analysis

The prepared products were subjected to sensory analysis by a panel of 20 members. The products were evaluated for the qualities of appearance, colour, texture, aroma and flavour using a 10 point grading scale (ISI, 1972). Each panel member was presented with a coded sample of Chikki. The sensory analysis was repeated at 7, 14, 21 and 28 days of storage to study the keeping quality of the product. The data was subjected to statistical analysis making use of a software 'Instat'. Mean and standard deviation of the sensory scores were calculated for all products. The analysis of variance was conducted in between attributes of the product to determine significant differences.

Result and discussion

The chemical composition of different types of jaggery is presented in Table 1. The moisture content of samples varied from 9.2 to 12.7%. According to Patil and Adsule (1998) jaggery can be classified as special up to moisture content of 6% and of grade 'A' with 8.1 to 10% moisture. According to this classification the samples in the present study belonged to grade 'A' and 'B'. The protein content was very low ranging from 0.1 to 0.6%. The mineral content was low in palm jaggery (0.88%) followed by white jaggery (1.28%), black jaggery (1.44%) and cream jaggery (2.04%). The ash content of samples was very low in comparison with the permissible level up to 6%. The calcium content of jaggery depends upon the amount of salt which is used for the preparation of jaggery since lime is used as a bleaching and clarifying agent. Jaggery samples also had a fair content of phosphorus which also may be due to the addition of clarifying agent. Palm jaggery and black jaggery also contained 7mg of iron whereas others contained less. The iron content of jaggery is due to boiling of sugar cane juice in iron pans during manufacturing.

Table 1. Chemical composition of different types of jaggery

Constituents (per 100g)	Palm jaggery	Cream jaggery	White jaggery	Black jaggery
Moisture (g)	9.2±0.209	10.7±0.106	10.3±1.089	12.7±0.006
Protein (g)	0.10±0.005	0.2±0.001	0.63±0.001	0.53±0.001
Total ash (g)	0.88±0.53	2.04±0.23	1.28±0.38	1.44±0.25
Calcium (mg)	14.0±2.27	8.0±1.70	8.0±0.57	10.0±0.57
Phosphorus (mg)	44.0±5.65	112±0.01	40±0.01	52±5.65
Iron (mg)	7.0±1.4	4.0±0.03	2.0±0.04	7.0±1.4

Table 2. Insoluble matter and sugar profile of jaggery samples

Constituents (per 100g)	Palm jaggery	Cream jaggery	White jaggery	Black jaggery
Insoluble matter (g)	0.70±0.21	0.48±0.37	0.53±0.30	0.78±0.19
% Reducing sugar	24.3±1.76	22.5±4.17	19.6±0.001	24.3±1.76
% Total sugar as invert sugar	83.4±2.33	83.5±1.33	82.3±2.26	83.4±2.33
% Sucrose	56.2±0.49	57.8±1.77	59.5±2.12	56.2±0.49
% Total sugar	80.4+2.26	80.3±2.40	79.1±2.12	80.4±2.26

The insoluble matter of the jaggery samples were estimated and found to be very low. Black jaggery contained 0.7%, palm jaggery 0.71%, white jaggery 0.53% and cream jaggery 0.48%. These levels were lower than permissible level of extraneous matter up to 1% in special jaggery. The sugar profiles of all the jaggery samples are also given in Table 2. The reducing sugar content of the jaggery samples were high and ranged from 19.6 to 25.9%. These values are slightly higher than those recommended for good jaggery. The total sugar content as invert sugar was 82.3 to 83.45 whereas total sugar was 79 to 80%. The sucrose content of jaggery samples ranged from 56.2 to 59.5%. It can be seen that there is a close correlation between reducing and total sugar content of jaggery samples and they were almost similar in sugar.

The stages of cookery of jaggery given in Table 3 indicate that the samples are different in comparison with sugar which is taken as a control. While the thread stage of sugar and jaggery are similar there was an enormous difference in subsequent stages. Differences were also observed in different stages of jaggery. The soft ball stage was attained at 113°C for sugar whereas palm jaggery, cream jaggery and black jaggery reached the stage at a slightly lower temperature. For white jaggery it was a higher temperature of 129°C, whereas for whiter jagggery it was

Table 3. Stages of Cooking (Temperature in °C)

Stages	Control	Maida	Corn flour	Dalda	Milk Powder
Sugar					
Thread stage	109	98	98	110	108
Soft ball	113	98	99	113	113
Firm ball	118	98	102	121	115
Hard ball	129	100	102	126	119
Soft crack	139	103	103	139	127
Hard crack	151	105	105	153	133
Caramel	170	110	108	170	156
Palm jaggery					
Thread stage	105	96	97	105	105
Soft ball	108	97	98	108	109
Firm ball	112	98	98	112	112
Hard ball	114	98	99	117	116
Soft crack	116	101	99	120	119
Hard crack	119	102	100	125	124
Caramel	122	103	103	130	130
Cream jaggery					
Thread stage	105	98	97	106	107
Soft ball	110	98	97	110	112
Firm ball	112	98	97	113	114
Hard ball	114	98	98	117	117
Soft crack	124	100	98	123	118
Hard crack	128	101	99	125	122
Caramel	136	104	100	139	127
White jaggery					
Thread stage	108	97	96	110	108
Soft ball	117	97	96	113	112
Firm ball	127	97	96	116	115
Hard ball	133	97	96	119	119
Soft crack	135	97	96	122	122
Hard crack	138	97	96	126	125
Caramel	142	99	98	132	130
Black jaggery					
Thread stage	106	97	97	108	110
Soft ball	111	98	97	111	112
Firm ball	114	98	97	115	114
Hard ball	118	98	98	118	118
Soft crack	123	98	98	123	121
Hard crack	129	98	98	125	123
Caramel	135	99	100	130	130

133°C. For the other jaggery samples it was a low temperature of 114°C (palm jaggery), 118°C (black jaggery) and 120°C (cream jaggery). For the soft crack stage, the temperature of sugar was 139°C. At that stage the white jaggery also followed the trend of other jaggery by altering the stage at lower temperature. This trend was followed for the hard crack and caramel stage wherein jaggery samples reached the stages very early in comparison to sugar.

Different ingredients were added to jaggery samples for determination of stages of cookery and results are given in Table 3. It can be seen that there was not much difference in the temperature on addition of two flour samples namely, maida and corn flour. In both the cases jaggery solutions gelatinised completed and it was not possible to get clear stages. Sugar solutions also behaved in a similar way. On addition of maida flour, the maximum temperature attained by sugar was 110°C, by palm jaggery 103°C, by cream jaggery 104°C and by black and white jaggery 99°C. Corn flour also showed similar results with slight variation.

On addition of dalda no differences were observed in sugar cooking stages. The jaggery samples behaved differently. A higher temperature could be attained for palm jaggery and cream jaggery but the temperatures were lowered for white and black jaggery samples. On addition of dalda a lesser variation was encountered in between jaggery samples. On addition of milk powder, sugar solution attained the stages very quickly, reaching the caramel stage of 156°C temperature. The jaggery samples exhibited a higher temperature for palm jaggery and for black jaggery. The temperatures were lower for cream and white jaggery. Addition of milk is known to change the profile of stages of cooking because of enhanced Maillard reaction. However in case of jaggery samples it did not follow a predictable trend. It can be concluded that when jaggery is used for preparation of sweets the composition and amount of ingredients used will influence the stages thereby affecting the texture of the product.

The prepared products were subjected to sensory evaluation by a panel of 20 members. The results are presented in Table 4. The analysis of Batch 1 product revealed that highest scores were obtained by Chikki prepared with sugar in comparision with Chikkis made with jaggery. The scores did not differ much in Chikkis made with jaggery except for the product E (made with black jaggery) in the qualities of appearance and texture. Analysis of variance revealed extremely significant differences in qualities of products for all variables. On application of post test, Bonferroni 'P' value which compares two individual samples it was seen that significant differences were seen only when jaggery Chikkis were compared with sugar Chikkis (Table 5). In between the jaggery Chikkis there were no significant differences in the quality attributes except for a marginal difference in texture.

Table 4. Mean scores for sensory attributes of products

Products	Appearance	Colour	Texture	Aroma	`Flavour`
Initial					
A	8.25±1.02	8.25±1.12	7.10±1.37	7.95±1.27	8.40±0.82
B	5.25±1.33	5.05±1.70	5.15±1.66	5.30±1.78	5.60±1.95
C	5.25±1.84	5.80±1.64	5.10±1.51	5.35±1.66	6.15±1.56
D	5.10±1.80	5.15±1.59	5.50±1.93	5.40±1.73	5.70±2.07
E	4.60±1.81	5.00±1.83	3.30±1.75	5.20±1.96	5.50±1.93
After 7 days					
A	8.70±1.08	8.75±0.96	8.10±1.48	8.50±1.10	7.95±1.84
B	5.40±1.66	5.10±1.41	4.65±1.81	5.80±1.54	5.90±1.83
C	5.45±1.57	5.60±1.81	4.85±1.38	6.10±1.81	5.60±1.75
D	4.55±1.19	4.70±1.59	4.85±1.18	5.85±1.78	5.25±1.86
E	4.60±1.73	3.85±1.22	5.45±1.57	5.55±1.84	5.30±1.52
After 14 days					
A	8.40±0.75	8.30±0.73	7.65±1.31	7.95±1.19	8.25±0.78
B	5.50±1.14	4.75±1.16	5.05±1.19	5.55±1.57	5.55±1.57
C	6.35±1.22	6.25±1.20	5.50±1.23	5.80±1.64	5.90±1.58
D	5.05±1.05	5.00±1.45	4.95±1.63	5.35±1.81	5.00±1.77
E	4.60±1.56	4.20±1.73	5.55±1.43	4.95±1.66	5.15±2.18
After 21 days					
A	8.75±0.71	8.40±0.88	8.10±0.96	8.45±0.94	8.40±1.14
B	5.40±1.35	5.35±1.18	5.05±0.99	5.15±1.53	5.05±1.84
C	6.10±1.65	6.05±1.31	5.55±1.23	6.05±1.09	6.20±1.43
D	5.40±1.56	5.35±1.46	5.00±1.21	5.75±1.16	5.80±1.57
E	4.65±1.38	4.55±1.35	5.10±1.65	5.25±2.12	4.95±2.11
After 28 days					
A	8.35±0.98	8.20±0.83	7.80±1.05	7.60±1.23	7.85±1.30
B	6.40±1.53	5.90±1.16	6.50±1.05	6.55±1.09	6.80±1.36
C	6.95±1.23	6.65±1.31	6.35±1.46	6.75±1.33	7.10±1.37
D	6.15±1.53	5.95±1.66	5.99±1.37	6.40±1.53	6.60±1.53
E	6.10±1.61	5.50±1.50	6.20±1.36	6.50±1.79	7.10±1.80

Products - Chikkis made with A = sugar, B = palm jaggery, C = cream jaggery, D = white jaggery and E = black jaggery

Table 5. Level of significance in between sensory scores of products

Comparison	Appearance	Colour	Texture	Aroma	Flavour
Initial					
A vs B	***	***	**	***	***
A vs C	***	***	**	***	***
A vs D	***	***	*	***	***
A vs E	***	***	**	***	***
B vs C	ns	ns	ns	ns	ns
B vs D	ns	ns	ns	ns	ns
B vs E	ns	ns	ns	ns	ns
After 7 days					
A vs B	***	***	***	***	***
A vs C	***	***	***	***	***
A vs D	***	***	***	***	***
A vs E	***	***	***	***	***
B vs C	ns	ns	ns	ns	ns
B vs D	ns	ns	ns	ns	ns
B vs E	ns	ns	ns	ns	ns
After 14 days					
A vs B	***	***	**	***	***
A vs C	***	***	**	***	***
A vs D	***	***	*	***	***
A vs E	***	***	**	***	***
B vs C	ns	**	ns	ns	ns
B vs D	ns	ns	ns	ns	ns
B vs E	ns	ns	ns	ns	ns
After 21 days					
A vs B	***	***	**	***	***
A vs C	***	***	**	***	**
A vs D	***	***	*	***	***
A vs E	***	***	**	***	***
B vs C	ns	ns	ns	ns	ns
B vs D	ns	ns	ns	ns	ns
B vs E	ns	ns	ns	ns	ns
After 28 days					
A vs B	***	***	*	ns	ns
A vs C	*	**	**	ns	ns
A vs D	***	***	***	ns	ns
A vs E	***	***	**	ns	ns
B vs C	ns	ns	ns	ns	ns
B vs D	ns	ns	ns	ns	ns
B vs E	ns	ns	ns	ns	ns

***: $P \leq 0.001$, **: $P \leq 0.01$. *: $P \leq 0.05$, ns: not significant.
Products - Chikkis made with A = sugar, B = palm jaggery, C = cream jaggery, D = white jaggery and E = black jaggery.

Batch 2 products exhibited a similar type of score wherein sugar based Chikkis obtained higher score followed by jaggery based Chikki. Similar results were obtained for the subsequent batches every week. Analysis of variance also revealed extremely significant differences in all the sensory qualities. Comparison between two samples again indicated that in all the batches the jaggery samples differed significantly only with sugar based Chikkis

whereas between jaggery based chikkis no significant differences were encountered.

At the end of storage period i.e. 28 days, there was a slight change in the response of panellists and no significant difference was found in the quality of aroma and flavour and flavour in sugar or jaggery based Chikkis.

On further analysis of sensory evaluation data when the products were evaluated for the individual quality, during storage, it was found that for a given attribute the score did not change over storage period. For all the attributes scores obtained were very similar by the products. Analysis of variance also revealed only marginal differences in any product in any quality except for the textural quality of product E.

It can be concluded that while there is a difference in Chikki prepared with either sugar or jaggery, the jaggery Chikkis were similar to each other. On storage the quality of product did not deteriorate and it retained the quality of all attributes. In view of higher content of iron in jaggery, it can be recommended that jaggery can be used more for preparation of products and the products can be stored and used upto four weeks.

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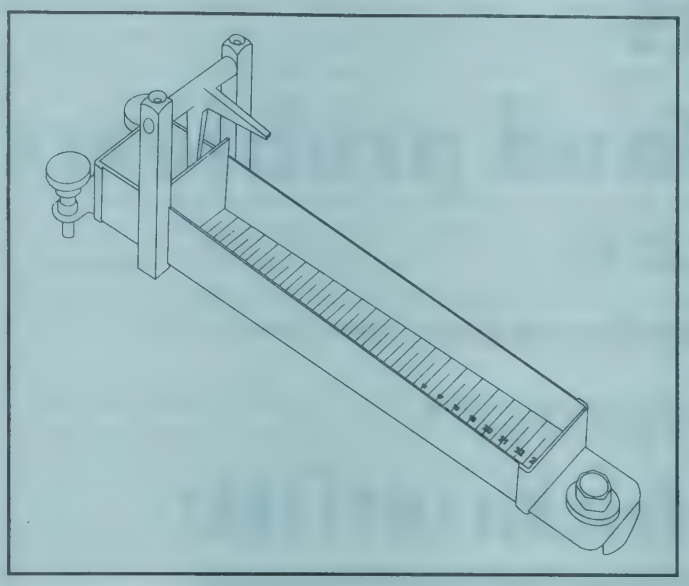

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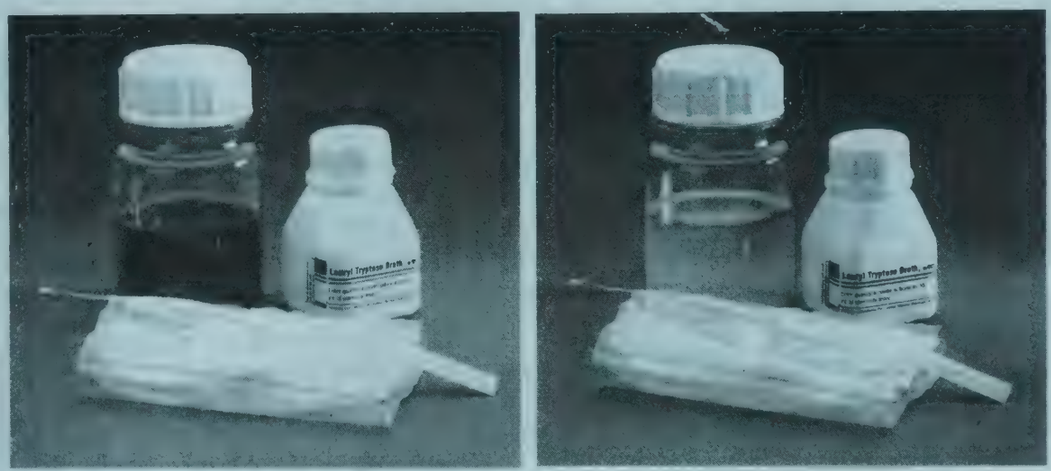

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Preparation of Quality Products from Potato

by

V. P. Kad, P. A. Unde*, H. G. More and R. S. Chobe

Abstract

The dehydrated potato products (viz., slices, cubes and sticks) were prepared using partially osmotic dehydration and mechanical drying. The organoleptic properties of these products were studied. Based on the results, it was found that the dehydrated potato products were acceptable. The maximum overall acceptability of dehydrated potato products was between 7.8 to 8.7. The dehydration ratio and rehydration ratio ranged between 3.93 to 5.50 and 2.05 to 4.13 respectively. The better colour, texture, taste and crispness was obtained from osmotically dehydrated treatment.

Introduction

The purpose of processing is to maintain or enhance the quality of agricultural products and to make the products marketable along with increase in shelf life and nutritive value. Commercially processing of potato is very limited in our country. The consumption of processed products from potato is only 1 to 2 per cent as against 50 per cent in most of the developed countries (Singhal, 1996). It has been estimated that the losses in storage, transportation and ripening are of the order of 25 to 30 per cent (Burton, 1962). It is, therefore, necessary to develop a suitable technique for processing potatoes. The various potato products, viz., potato slices, french fries (cubes and sticks), flakes and pulp are being manufactured commercially and also exported. Conventional and mechanical drying gives the product poor organoleptic and rehydration properties. To overcome these problems, potato products could be dehydrated partially by osmotic dehydration and further using mechanical drying methods. The present study was, therefore, carried out with the view to prepare dehydrated products from potatoes for better quality, using both osmotic and mechanical drying methods.

Materials and Methods

The dehydrated potato products were prepared as per the flow chart given below in Fig.1.

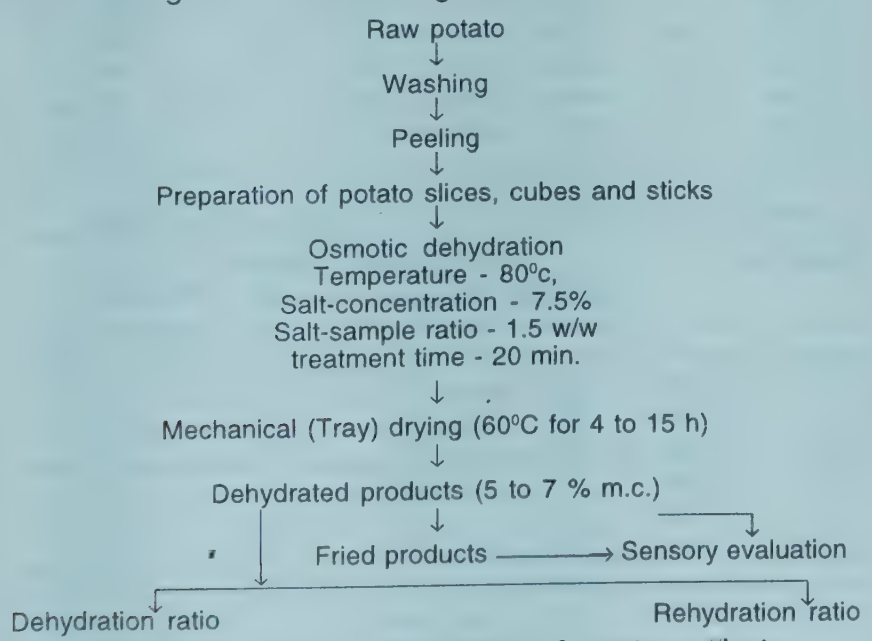

Fig. 1: Flow chart for preparation of potato products

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Fresh, uniform size and disease free potatoes (var.- Local) were procured from the local market. Washing was done to remove all contaminant viz., dirt, sand, mud etc. Peeling of potato was done using mechanical peeler (make- Sanjay, Thane, capacity - 180kg/h). Slicing of potato was done using mechanical rotary slicer (make-Sanjay, Thane, capacity-75kg/h). The slices 1mm thick and 50 to 70mm in diameter, cubes of 10x10x1 mm^3 and sticks 10x10x5 mm^3 size were prepared using hand knives and super slicer machine. The potato slices, cubes and sticks were dipped in 0.1 per cent potassium metabisulphite to avoid the enzymatic browning. Osmotic dehydration was carried out using various salt concentrations (5 to 15%), salt temperature (50^0 to 90^0C), salt-sample ratio (1:1 to 1:3 w/w) and time of brining (10 to 50 min.). Total 31 treatments combination were taken for these studies and tabulated. (Table 1). The final drying was carried out in mechanical tray dryer (make : Gardner, New Delhi) at 60^0C (Vijayanand ***et al.***, 1995). The total drying time was taken to get the final moisture content of 5 to 7 per cent of dried product (Yahya, 1988).

Table 1: Experimental design for Osmotic Dehydration

Treatment	Temperature °C	Salt concent-ration%	Salt-sample ratio, w/w	Treatment time, min.
T1	60	7.5	1.5	20
T2	**80**	**7.5**	**1.5**	**20**
T3	60	12.5	1.5	20
T4	80	12.5	1.5	20
T5	60	7.5	2.5	20
T6	80	7.5	2.5	20
T7	60	12.5	2.5	20
T8	80	12.5	2.5	20
T9	60	7.5	1.5	40
T10	80	7.5	1.5	40
T11	60	12.5	1.5	40
T12	80	12.5	1.5	40
T13	**60**	**7.5**	**2.5**	**40**
T14	80	7.5	2.5	40
T15	60	12.5	2.5	40
T16	80	12.5	2.5	40
T17	50	10.5	2.0	30
T18	90	10.0	2.0	30
T19	**70**	**5.0**	**2.0**	**30**
T20	70	15.0	2.0	30
T21	70	10.0	1.0	30
T22	70	10.0	3.0	30
T23	70	10.0	2.0	10
T24	70	10.0	2.0	50
T25	70	10.0	2.0	30
T26	70	10.0	2.0	30
T27	70	10.0	2.0	30
T28	70	10.0	2.0	30
T29	70	10.0	2.0	30
T30	70	10.0	2.0	30
T31	70	10.0	2.0	30

Dehydration and rehydration ratios

The dehydration ratio was calculated using the formula.

$$\text{Dehydration ratio} = \frac{\text{Weight of raw materials (g)}}{\text{Weight of dehydrated materials (g)}} \quad (1)$$

$$\text{Rehydration ratio} = \frac{\text{Weight of reconstituted dehydrated samples (g)}}{\text{Weight of dehydrated sample (g)}} \quad (2)$$

The dehydrated samples were cooked in boiling water for 20 min. Excess water was drained off and cooled materials were then weighed. Rehydration ratio was determined by the formula (Ranganna, 1986).

Organoleptic properties of dehydrated and fried potato products

The organoleptic properties, viz. colour, texture, taste and crispness were determined on the basis of 9 point hedonic scale by a panel of 10 judges of different age groups and food habits (Anonymous, 1971). The overall acceptability of the product was taken as the average score of all these organoleptic properties.

Results and Discussion

Preparation of potato products

The potato products using osmotic treatments of salt concentrations (5 to 15%) salt temperature (50°C to 90°C), salt-sample ratio (1:1 to 1.3 w/w) and time of brining (10 to 50 min) followed by tray drying (4-16h) were prepared. Total 31 treatments were used for these studies. Out of these treatments the potato products prepared from T2, T13 and T19 gave better quality products. Similar results were obtained by Yahya (1988) and Vijayanand ***et al.***, (1995). Total drying time required was 4-6, 8-14 and 10-16 h in case of slices, cubes and sticks, respectively. The dehydration ratio, rehydration ratio and organoleptic properties of these samples were studied.

Dehydration and rehydration ratio

The dehydration and rehydration ratios of potato products are tabulated in Table 2. The dehydration ratio for potato slices, cubes and sticks varied between 3.37 to 5.50. The dehydration ratio depended on the initial and final moisture content of the products. The rehydration ratios for potato slices, cubes and sticks varied between 2.05 to 4.13. The maximum dehydration ratio wad found in case of treatment T2 (3.73 to 4.31), T13 (3.90 to 4.44) and T19 (5.10 to 5.50). Whereas maximum rehydration ratio was found in case of treatment T2 (3.05 to 4.13) followed by T19 (3.05 to 4.10) and T13 (3.05 to 4.01).

Table 2: Dehydration ratio and Rehydration ratio

Treatment	Dehydration ratio			Rehydration ratio		
	Slices	Cubes	Sticks	Slices	Cubes	Sticks
T1	3.49	3.43	3.57	3.15	3.09	2.92
T2	**4.31**	**3.73**	**3.94**	**4.13**	**3.11**	**3.05**
T3	3.61	3.38	3.45	3.13	3.09	2.87
T4	3.56	3.81	3.91	3.22	2.94	2.81
T5	3.93	3.37	3.43	3.77	3.05	3.04
T6	3.57	4.18	3.59	3.12	2.87	2.95
T7	3.97	3.57	3.43	3.79	3.08	2.86
T8	4.07	3.42	3.62	3.75	2.98	2.96
T9	4.32	3.73	3.95	4.01	3.02	2.63
T10	3.49	3.44	3.57	3.13	2.91	2.63
T11	4.28	3.75	3.88	3.92	2.85	2.58
T12	3.56	3.81	3.91	3.25	3.10	2.64
T13	**4.44**	**3.90**	**4.27**	**4.01**	**3.05**	**3.05**
T14	4.57	4.11	4.66	3.98	2.90	2.82
T15	3.78	4.26	4.08	3.46	2.91	2.53
T16	3.65	4.16	3.92	3.15	2.83	3.07
T17	4.21	3.88	3.88	3.89	2.93	2.28
T18	4.51	4.07	4.00	3.90	3.05	2.27
T19	**5.50**	**5.21**	**5.10**	**4.10**	**3.05**	**3.08**
T20	4.29	4.19	4.16	3.92	2.84	2.80
T21	4.26	3.95	4.19	4.02	2.81	3.05
T22	3.81	4.31	3.77	3.24	2.65	2.17
T23	3.82	3.78	3.60	3.30	2.59	2.05
T24	3.80	3.73	3.54	3.24	2.76	2.09
T25	3.70	3.71	3.87	3.11	2.81	2.80
T26	3.56	3.92	3.81	3.13	2.98	2.82
T27	4.31	4.27	3.88	3.97	2.81	2.88
T28	3.80	3.86	3.88	3.29	3.12	2.66
T29	3.65	3.92	4.27	3.20	2.85	3.00
T30	3.91	3.97	3.77	3.46	3.02	2.38
T31	3.66	3.72	3.86	3.22	2.82	2.82

Organoleptic properties

Sensory evaluation of various potato products for organoleptic properties viz., colour, texture and taste was done and average score of colour, texture and taste was taken as overall acceptability of potato products (Table 3). The overall acceptability for potato slices, cubes and sticks varied between 4.8 to 8.7. The maximum overall acceptability was found in case of treatment T2 (8.1 to 8.7) followed by T13 (8.0 to 8.4) and T19 (7.8 to 8.0). The

Table 3: Organoleptic properties of dehydrated potato products

Treatment	Overall Acceptability		
	Slices	Cubes	Sticks
T1	7.1	7.0	6.6
T2	**8.7**	**8.4**	**8.1**
T3	6.5	6.1	6.0
T4	6.6	6.1	5.7
T5	8.2	7.6	7.8
T6	7.4	7.4	6.9
T7	6.4	6.5	6.2
T8	6.2	7.0	7.1
T9	7.6	7.0	6.7
T10	7.3	6.6	6.3
T11	7.3	5.9	5.5
T12	6.7	6.2	5.9
T13	**8.4**	**8.0**	**8.0**
T14	6.5	6.7	6.6
T15	7.2	5.8	5.5
T16	6.4	6.4	6.7
T17	7.4	6.7	7.0
T18	6.9	6.9	7.0
T19	**7.9**	**8.0**	**7.8**
T20	5.7	5.7	5.3
T21	6.5	6.3	6.3
T22	5.9	5.8	5.1
T23	6.3	5.0	4.8
T24	6.2	5.0	5.1
T25	6.6	6.3	6.4
T26	6.3	6.2	6.4
T27	6.9	6.3	6.2
T28	6.5	6.4	6.4
T29	6.3	6.3	6.6
T30	6.8	6.4	6.2
T31	7.3	7.0	6.8

Table 4: Organoleptic properties of fried potato products

Treatment		* Sensory Attributes			
		Crispness	Texture	Taste	Overall acceptability
T2	Slices	8.9	8.2	8.6	8.6
	Cubes	8.5	8.7	8.6	8.6
	Sticks	9.0	8.4	8.5	8.6
T13	Slices	8.2	8.3	7.4	8.0
	Cubes	7.8	7.4	7.5	7.6
	Sticks	8.1	8.6	7.2	8.0
T19	Slices	8.3	7.5	7.1	7.6
	Cubes	7.5	7.4	7.0	7.3
	Sticks	7.3	6.8	6.3	6.8

* Average of 10 evaluators

Contd. on Page 40

Business Process Management at the Centre of Implementation of ISO 9000 : 2000

by
Sohrab

The emergence of global markets of unprecedented magnitude has created a demand for globally standardized products. With the advent of ISO 9000 Quality Management System standards brought out by International Organization for Standardization (ISO), the concept of quality has taken a tangible form. For the first time there is a broad consensus about quality management system's minimum requirements. These standards have become the subject of intense focus worldwide and are important both as a potential market place requirement and as a marketable company feature. This presents a good opportunity for the industry for improving its quality and bringing uniformity and consistency in its supplies in the international market.

The changing needs and expectations of the customers are driving organizations to continually improve their processes and operations to add enhanced value to their products and services to meet this changing need. When processes are stable and they work in harmony with each other to produce desired results, this is the time for launching continual improvement to sustain in business.It is in this context that ISO 9000 Quality Management System Standards have assumed greater importance for achieving the stability in the processes. The process management approach of ISO 9001:2000 has brought it closer to business processes. This approach facilitates an organization's ability to identify and understand its activities and interdependencies

The activities people perform come in logical sequences which together combine into business processes. It is the performance of the business processes as a whole that is important. Individual departments or functions may excel, but if they do not combine effectively in the processes that deliver customer service, their efforts will be futile. The customer will be dissatisfied if only one link in the chain fails. The co-ordination of a number of management groups, each controlling a different part of a process, is difficult because of the communication barriers that organizational boundaries cause. The business process management that focuses on integrating and streamlining the 'horizontal' flow of activities by different groups working within the business and on building teams to support that flow.is essential to deliver products and services to customers.

Business process management concentrates on inducting efficiency in individual processes that deliver the result. A process is a systematic series of events, which uses resources to transform inputs and add value to create outputs to achieve specific goals. They create a change of state of inputs such as material, information, and people and pass them through a sequence of activities where inputs are transformed into an output with different characteristics. A business process consists of a group of logically related tasks that use the resources of the organization to provide defined results in support of the organization's objectives. The process approach facilitates an organization's ability to identify and understand its activities and interdependencies.

The quality management is highly customer focused. An organizations's quality management effort is a part of its strategy to satisfy its customers, to meet their expectations, and to meet the competition in the market place. Effective implementation of Quality Measurement System is directly related to the fulfilment of organizational objectives.

ISO 9000 and Business Process Management

Business process management (BPM) is the starting point for effective implementation of the concepts of ISO 9001 Quality Management Systems. The quality management system has recognized business process management as one of the key enablers for business excellence. There is a basic shift from procedure oriented system to process focussed system in the new standard. An output of one process can be input to another process. This way processes are combined in a process chain. The quality management system requires coordination and compatibility of its component processes and definition of their interfaces.

Managing through business processes help break down boundaries between a company's departments and functions and make individuals aware of how their work affects others. It fosters the building of internal chains of customers and suppliers (See Fig 1) so the company can respond to and satisfy the needs of external customers.

Fig 1 Differences between procedures and processes

Sl. No.	Procedures	Processes
1.	Procedure steps are completed by different people in different functional areas with different objectives	Process stages are completed by different people with the same objectives, functional areas do not matter
2.	Procedures are discontinuous	Processes flow to conclusion
3.	Procedures are driven by completion of the task	Processes are driven by achieving the desired output
4.	Procedures focus on satisfying paper work	Processes focus on satisfying customers

The main objectives of the business process improvement is to ensure that organization has business processes that:

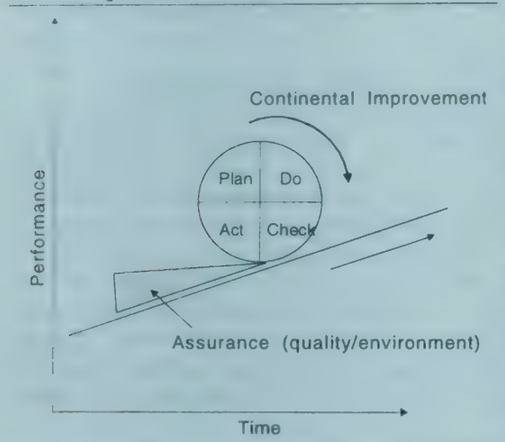
a) Eliminate error
b) Minimize delays
c) Maximize use of assets
d) Are customer friendly
e) Are adaptable to customer changing needs
f) Provide organization with a competitive advantage.

The business process management applies to all companies and comprises of two main activities:

a) defining the operation in terms of a formal system of business processes that represents the flow of work through the organization, as it occurs naturally across the boundaries of departments and functions rather than up and down the management hierarchy,
b) continually reviewing the operation of each process to identify areas of improvement including auditing, measuring process performance and bench marking. Such reviews often show that organization's performance can be improved significantly by making changes to their processes.

The principle of continual improvement in ISO 9001:2000 to pursue business process management by continually reviewing the operation of each process to identify areas of improvement is structured on the concept of PDCA (Plan-Do-Correct-Act) cycle (See Fig 2) and is represented as a wheel to emphasize the continual cyclical nature of the improvement process. The continual, improvement to enhance the features and characteristics of products and services to increase the effectiveness and efficiency of processes.

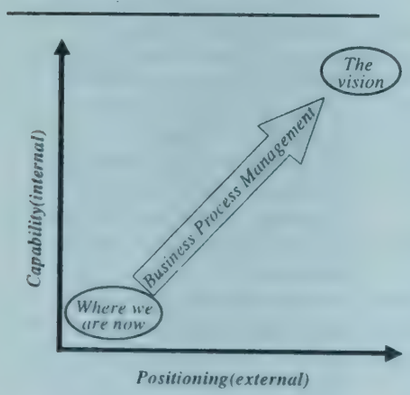
Fig. 2 Continental Improvement



Business process management contrasts sharply with that of traditional management. It focuses on integrating and streamlining the 'horizontal' flow of work and on building teams to support that flow. By contrast, traditional management focuses on control through 'vertical' hierarchical structures across the flow of work

Business process management process to deliver the vision of the organization depends on external positioning and internal capability (See Fig. 3). How the organization positions itself, will be determined by the circumstances of the business's internal capability.

Fig.3 POSITIONING & CAPABILITY



QUALITY CARE

Positioning determines which market and customer segments to serve, and which products/ services should be offered to each. In turn this requires an appreciation of external factors such as customer needs; competitors' initiatives; the financial needs of the organization; legislative and environmental constraints; shareholders' expectations etc. and internal factors such as the business processes through which products and services are delivered, skills, education and training of personnel, procedures and systems.

Positioning and capability are inextricably linked. For instance, it is not wise to position the organization to meet a market need which it is incapable of fulfilling - those with customers' charters beware - or which competitors can meet much better, or which will require an unreasonable deployment of resources.

Setting Vision Mission and Strategies

The organizations drift and managers become increasingly frustrated at the lack of direction from the top management. Their decision-making abilities are stifled by their uncertainty of the goals they are meant to achieve. Therefore a clear vision must be set for the organization. The vision is a definition of both the positioning and capability of the organization in the future, the combination of which provides clear competitive differentiation in whatever terms the customers measure. Many time organizations neglect to challenge and re-examine continuously their vision of the future and their role within it.

BPM helps organizations identify the needs of the markets they serve, and then enables them to grow the capability to satisfy those needs. It maps how processes work in practice and where the problems and failures occur. It provides the base from which to re-engineer the company's capability - from small-scale improvements by using tools like kaizon and small group activity to radical redesigns like technological innovation and upgradation. The key is to recognize where the emphasis should lie.

Meeting the needs of customers is the basic aim of every organization. Delighting them requires an understanding of the key differentiators that deliver the pleasantly unexpected and grow the bonds of customer loyalty that are so important to continuing success. In this process there are two main factors that come into play. Firstly, recognizing the features of service that will meet the needs of customers and delight them; secondly, developing the behaviors, skills, resources and processes of the organization in order to deliver those features efficiently and consistently. This requires the following three things to do:

a) Resources review and setting appropriate resource levels for each function. Identify opportunities for cost savings to ensure that the most effective and efficient use is made of the available resources. Frequently organizations concentrate on reducing costs and increasing efficiencies, while technological advances, market trends, competitor moves and the critical factors that delight customers are ignored.
b) Organizational review for restructuring the functional organization and altering management spans of control. This requires setting appropriate management spans of control and removes functional boundaries that inhibit responsiveness and effectiveness.
c) Systems review for improving focus of current planned information systems to ensure that planned information systems focus on the areas of maximum benefit to the organization.

Synergising ISO 9001 and BPM

Imperatives of Change

When vision for the future is set keeping in mind external environment, strategies need to be developed to charter business processes to achieve the goals. This cannot be done by staying where we are but to move to new state. This threatens the status quo. Breaking the status becomes eminent to bring the processes to new state of operation.

When the change in status quo is planned consistent with the organizational objectives, resistance to change develops and needs to be handled with care (See Fig 4). If proper strategies are not adopted, the change process enunciated may fail .The reasons why change process fails are:

a) When people are not involved in planning
b) When there is a poor communication within the organization
c) When there is a fear of failure
d) When excessive pressure of work is involved
e) When the cost of change is too high
f) When present situation seems all right
g) When there is a lack of trust in the organizational function initiating the change.

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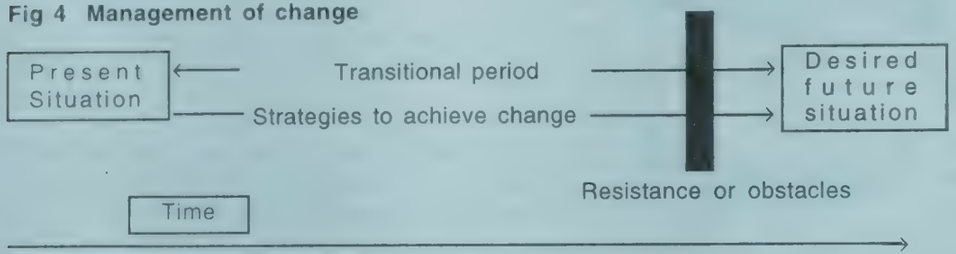
This requires that a well-knit team is formed to accomplish the task. In any group of individuals the following situation exists:

a) the first 15 percent people are pro-changers,
b) the next 35 percent people need bit of counseling to fall in line with the change process,
c) the next 35 percent people need persuasion to get into the change process,
d) the last 15 percent people are the difficult lot, leave them for the time being.

It may be seen that majority of the people can be brought to change process and last group comes round after seeing the process of change being accomplished.

While chartering the course of business process management and management of change, managers have to shed old management practices, the comfort of status quo the protective device which distinguish managers from staff, and the behaviors and attitudes which create fear and deference in others.

Fig 4 Management of change



There is no more powerful barrier to change than a pattern of managerial behavior that has in the past brought recognition and promotion to its practitioners. Seldom, however, will this behavior accord with the profile of behavior required for continual improvement. Managers, particularly middle managers, are likely to feel threatened by a doctrine which encourages staff to take responsibility for traditional management preserves, such as improving processes and customer service. Even as managers voice their support for continual improvement and believe themselves to be sincere - their actions may tell a different story.

Management of change

The impact of initial adjustment is quickly felt. Many of the ideas for improvement can be put into action immediately. People feel proud when they see their ideas accepted. They start to believe that managers are serious about listing to what staff has to say. Managers become aware of the untapped potential in the minds of the people reporting to them. They realize that they can rely on staff to take more responsibility for solving problems and satisfying customers.

The stage is set for building people's awareness of the need for behavioral change and for ensuring that top management tackles any barriers to change in a purposeful manner. This task is approached by:

a) education and training - tools, techniques, skills, measures, team-building, principles: these are assessed from a training needs analysis;
b) Examining internal mechanism for incentive and reward: reporting controls, reward system, and authorization levels. number of management levels, and so on ; to assess the degree to which they create barrier between people and induce fear of failure or punishment;
c) developing a structure to support continuous improvement;
d) Personal support to individual managers who find the behavior changes particularly difficult to come to terms with.

The experience is like a child's learning process. They do something that does not fit in with an adult's expectation. They cry, are upset or ashamed, perhaps fearful of punishment, but are unsure what they should have done differently. Their parent, teacher or relation is supportive, understanding that mistakes are part of any child's learning process. We tolerate their mistakes and are patient in supporting them in learning to distinguish what is right or wrong.Managers have to learn the same way, and be supported by their managers. As they develop confidence and understanding, they take on the supporting role with their subordinates and so on down the structure.

Cultural change

Education is the long-term process of building understanding of new concepts, influencing values, beliefs and attitudes, and stimulating desirable changes in behavior. It is a constant process of introducing and reinforcing key messages. It can be achieved in a myriad of ways from formal training, the role modeling to reward systems and other management tools, to conversation in the lunch break. Education is about learning, which by definition is never complete in the lifetime of individuals or organization is therefore an opportunity for education.

Training is one of the vehicles for education. It is a clearly defined action designed to enhance skills, knowledge and capability. It has a variety of forms, including trainer-led courses, on the job training, secondment, structure learning through projects, and so on.

The distinction between education and training is critical to any culture change, because of the differing degrees to which the implementation of each can be controlled. The training experience is focused, normally with clear inputs, a finite time scale and definite results. In the hands of professionals - whether in the training department or amongst line manager - it is manageable in a predictable way.

Educational experiences, by contrast, are more diverse and unpredictable. What affects one individual will not affect another. The learning experience itself may go unrecognized even though the effects are felt. For example, from the experience of working for a manager, whatever his or her management style, staff learn about "management" even if they have never given it a moment's conscious thought or attended a single training event.

There is no easy way to change attitudes and behavior. Education and training is recognized as playing a critical role in providing long term support to provoke discussion, teach new skills, challenge thinking and provide a catalyst for change.

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Processing of Pomegranate and Pomegranate Juice

by

H.G. More*, P. A. Unde and R. S. Chobe

Abstract

Pomegranate is a commercially important fruit crop grown in arid and semi-arid regions. This paper deals with extraction of seed (arils), preparation of anardana, processing and utilization of juice, rind dehydration and other value addition of commercial importance (syrup, wine, R.T.S.). A prototype machine has been developed by the department of Agricultural Process Engineering, M.P.K.V., Rahuri to separate arils and rind from pomegranate fruits. The anardana (dried pomegranate arils) was prepared using solar cabinet and mechanical tray dryer. Better quality anardana could be prepared by drying arils at 60°C for 4-6 hrs. The juice was extracted using muslin cloth, household mixer, basket press and screw juice extractor. The juice was clarified by using clarifying agents (PVP, bentonite, gelatin, pectinase), pasteurized and preserved. The juice pasteurized at 70°C for 30 minutes with 100 ppm KMS could be stored for 9 months at low temperature (5±1°C). Good quality wine can be prepared from Ganesh variety of pomegranate. Syrup of about 60° brix with 1.5% citric acid has a delightful taste and flavour. The syrup could be preserved by pasteurization or by addition of sodium benzoate. Pomegranate rind can be used in medicines, tanning industry, comestics and dyeing industry. Dehydrated rind was obtained in tray dryer at 60°C for 6-8 hrs. Good quality rind powder having 100 mesh size was obtained from the dehydrated rind by using hammer mill.

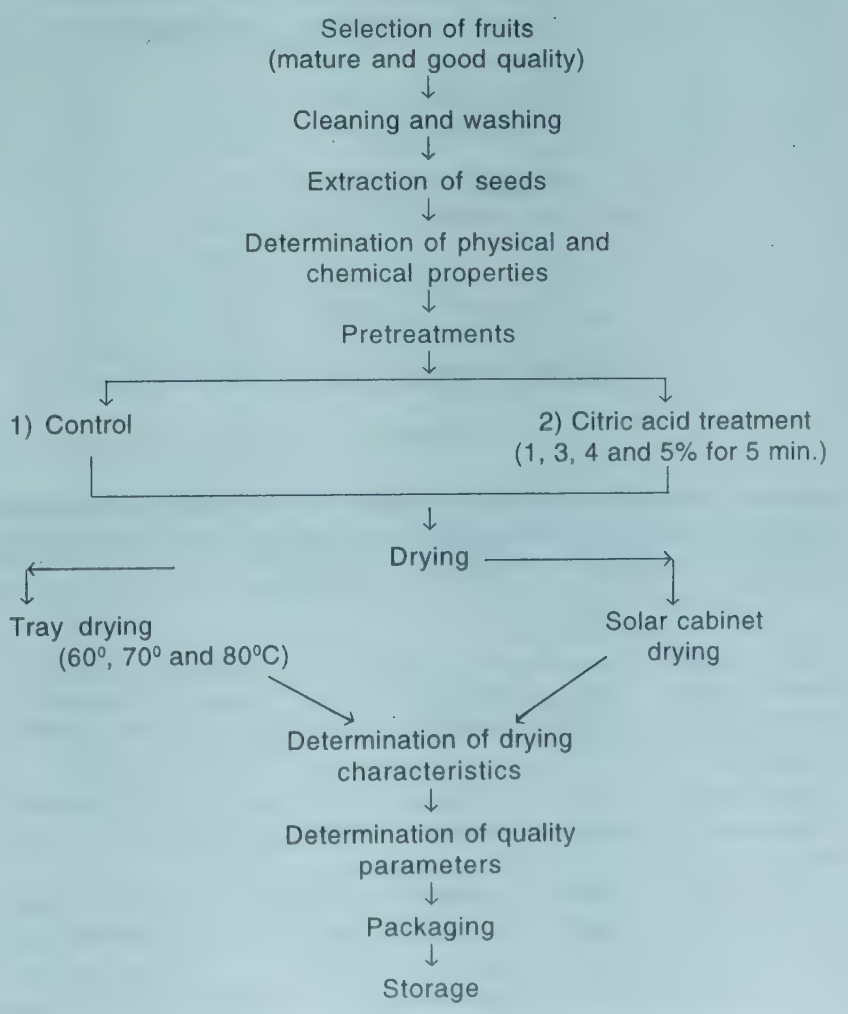
Introduction

Pomegranate is a fruit of tropical and subtropical regions. It has enjoyed a reputation for its healthy dietetic and medicinal properties. In recent years, the areas under this crop has increased substantially, mainly because of the verstability, adaptability, drought resistance, low maintenance cost and steady and high yield of the crop. Pomegranate fruits with large juicy grains which can give an attractive coloured juice with mild acid taste and low tannin content are the desirable characteristics for processing of pomegranate. Pomegranate juice is considered to be useful for patients suffering from leprosy, high cholesterol levels and heart disorders. The pomegranate fruit has therapeutic value, good keeping quality and export potential. However, with increase in area and production of pomegranate, there are often market gluts. Therefore processed products of pomegranate will not only avoid market gluts but also help in stabilizing the market prices and increase the scope for expansion of area and production of pomegranate fruit. The pomegranate juice can be processed into squash, syrup; nectar, jelly, RTS beverages, wine and such other products.

Materials and Methods

Uniform, ripe, well graded and cleaned pomegranate fruits (var. Ganesh) were taken. The pomegranate seeds (arils) were extracted using pomegranate seed extractor machine which has been developed by the Department of Agril. Process Engineering, College of Agricultural Engineering, Mahatma Phule Krishi Vidyapeeth, Rahuri. The extracted seeds (arils) were pre-treated by dipping in citric acid solution of different concentrations *viz.* control, 1, 3 and 5% for 5 min. for preparation of anardana (Kulkarni and Nawale, 1999). The flow chart for preparation of anardana is given in Fig.1. The seeds were further used for juice extraction by different methods. The extracted juice was clarified, pasteurized and preserved by using potassium metabisulphate at room and cold storage conditions, respectively (Amerine, 1965 and Chobe, 1999). The flow chart for juice processing is given in Fig. 2. Pomegranate juice can be utilised to make good quality wine. Sugar is added to the juice to adjust brix to 22-23. The pasteurized juice is fermented with started wine yeast. The fermentation is allowed to continue until desired level of alcohol is obtained. The wine is aged in the same manner as the red grape wine. A good quality wine has been prepared from Ganesh variety of pomegranate. A syrup of about 60° Brix with an added acidity of 1.5 per cent as citric acid has a bright purplish red colour and a delightful taste and flavour. It can be preserved by pasteurization or by addition of sodium benzoate (Kadam, 1999). The rind obtained after seed extraction was dehydrated using three different drying methods *viz.,* mechanical drying in tray dryer, solar cabinet drying and sun drying. Size reduction of dehy-

Fig. 1: Flow chart for preparation of Anardana



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drated rind was carried out using plate mill, hammer mill and powder mixer (Patil N.R., 1999). The procedure for preparation of pomegranate rind powder in given in Fig. 3.

Fig. 2: Flow chart for juice processing

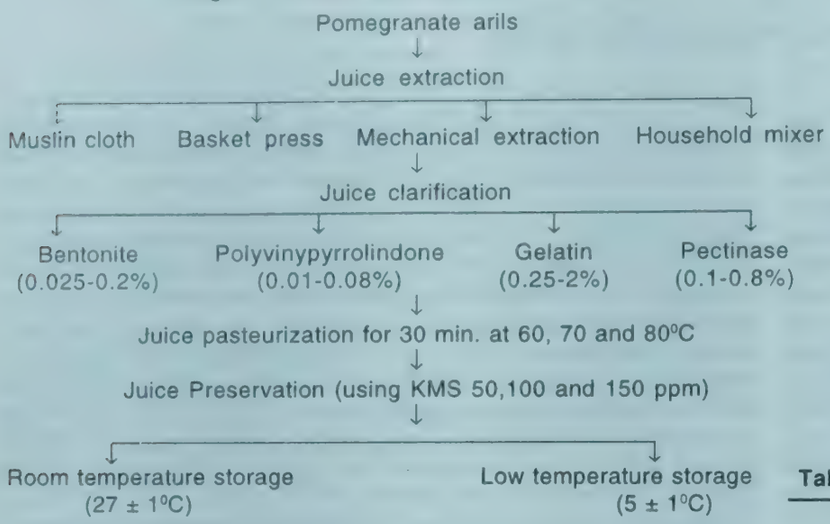
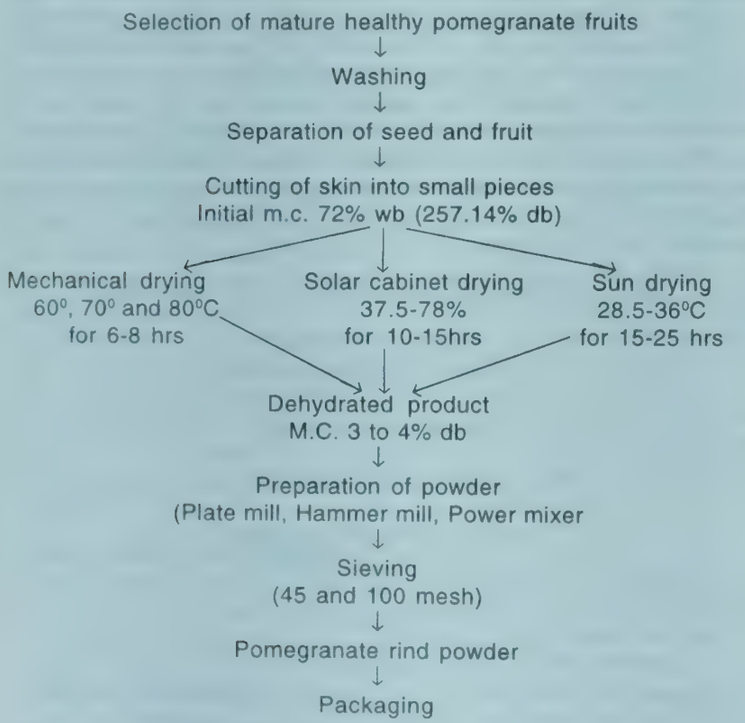


Fig. 3 Flow chart for preparation of pomegranate rind powder


Selection of mature healthy pomegranate fruits
Washing
Separation of seed and fruit
Cutting of skin into small pieces
Initial m.c. 72% wb (257.14% db)
Mechanical drying 60°, 70° and 80°C for 6-8 hrs
Solar cabinet drying 37.5-78% for 10-15hrs
Sun drying 28.5-36°C for 15-25 hrs
Dehydrated product M.C. 3 to 4% db
Preparation of powder (Plate mill, Hammer mill, Power mixer
Sieving (45 and 100 mesh)
Pomegranate rind powder
Packaging

Results and discussion

Anardana Preparation:

The drying time of 6, 4 and 6 hrs. was required for 60°, 70° and 80° C, respectively. In case of 80°C, 6 hrs were required, may be due to case hardening of the arils. The case hardening may be due to movement of soluble solids which deposits on the surface due to high temperature. The maximum drying rate observed was 517.6, 614.1 and 621.7 gm/hr/100gm dry matter at 60, 70 and 80°C drying temperature, respectively. The minimum drying rate was 0.87, 2.35 and 0.26 for 60, 70 and 80°C respectively. The original colour of the arils was maintained to a great extent when dried at 60°C. The data on effect of citric acid treatment on acidity of anardana is given in Table 1. For 1% increase in citric acid concentration, 0.1 to 0.2% increase was observed in the acidity of anardana. The acidity of anardana is normally 7%. Pomegranate fruits having higher acidity are used for making anardana. Sweet varieties are given acid treatment to increase the acidity.

Table 1. Effect of citric acid treatment on acidity of Anardana

Treatment	Acidity
Pomegranate	0.616
Control dried	1.254
1% dipping	1.450
3% dipping	1.650
4% dipping	1.770
5% dipping	2.010

Juice processing:

The data on juice yield and other quality parameters (chemical composition) is tabulated in Table 2. The maximum juice yield (61%) was obtained in case of household mixer followed by screw juice extractor (55%), basket press (48%) and muslin cloth (40%). The juice yield appeared to be maximum in case of household mixer due to crushing of the whole seeds. It increases the turbidity, tannin content and sedimentation. The basket press method is time consuming, tedious and gave low yield as compared to screw juice extractor. The juice obtained from the screw juice extractor appeared to be acceptable as compared to all other methods. Considering overall acceptability, juice yield and tannin content, the screw juice extraction method was found suitable. The quality parameters such as colour, flavour and taste are also comparable with muslin cloth method. The data on effect of clarifying agent on quality of pomegranate juice is given in Table 3. The clarification of the juice was maximum in case of pvp treated juice at 0.05% concentration. The optical density obtained for this

Table 2: Effect of extraction methods on the yield and chemical composition of pomegranate juice

Extraction method	TSS (%)	Acidity (%)	Ascorbic acid (%)	pH	Tannins (%)	Total sugars (%)	Reducing sugars (%)	Non-reducing sugars (%)	Juice yield (%)	Colour
Muslin cloth	15.33	0.5013	0.012	3.19	0.285	13.50	12.25	1.25	40	Pink
Screw juice extractor	16.00	0.8959	0.018	3.067	0.486	14.1	12.95	1.15	55	Reddish, pink
Basket press	15.77	0.8313	0.015	3.16	0.385	13.75	12.40	1.35	48	Pink
Household mixer	16.20	0.9166	0.020	3.00	0.520	14.65	13.48	1.17	61	White pink
S.E. ±	0.1907	0.02813	0.00052	0.2133	0.0032	0.1098	0.1010	0.0144	-	-
C.D. at 5%	0.6231	0.09189	0.0017	0.0697	0.0106	0.3588	0.3301	0.0047	-	-
C.V. (%)	1.2053	3.577	3.226	0.6869	0.776	0.7845	0.792	1.1736	-	-

treatment was 0.3598 followed by gelatin (1.00%) 0.4859. This was also evident from per cent transmission. The per cent transmission was found to be 43.47 in pvp (0.05%) treated juice followed by gelatin (1%) 34, bentonite (0.1%) 33.34 and pectinase (0.5%) 32.67. The overall acceptability of pvp treated juice was found maximum followed by gelatin, bentonite and pectinase.

The pvp (0.05%) clarified pomegranate juice was used for further studies on preservation and storage. The data on effect of pasteurization temperature and preservation concentration on juice quality during room temperature storage and low temperature storage is given in Table 4 and Table 5, respectively. The reduction in acidity and tannin content was observed with increasing storage period. The T.S.S., acidity, ascorbic acid and total sugar in case of juice pasteurized at 70°C and treated with 100 ppm KMS found were 16.50, 0.47. 0.48, 0.010 (10mg/100ml) and 14.00-14.10 per cent respectively, when stored for 120 days at room temperature and 270 days at low temperature storage. These quality attributes were comparable to fresh juice.

Table 3: Effect of clarifying agent on quality of pomegranate juice

Clarifying agent	Percent transmission	Optical density	Colour	Flavour	Taste	Overall acceptability
PVP (0.05%)	44.0	0.3598	8.0	7.8	7.7	7.8
Bentonite (0.1%)	33.5	0.4772	7.4	7.2	7.0	7.0
Gelatin (1%)	33.5	0.4772	7.6	7.2	7.0	7.2
Pectinase (0.5%)	33.0	0.4859	6.8	6.8	6.7	6.7

Table 6: Fineness characteristics of pomegranate rind power obtained from various size reduction methods

Grinding machine	Fineness modules	Average size of particles, D(mm)	uniformity index (Course: Medium: Fine)
Plate mill	2.18	0.47	0 : 3 : 7
Hammer mill			
45 mesh	1.62	0.32	0 : 2 : 8
100 mesh	1.34	0.26	0 : 1 : 9
Power Mixer	2.45	0.56	0 : 4 : 6

Rind dehydration: The initial moisture content of the rind is 72% and it was dried upto 3-4% final moisture content (Fig.3), Tray drying at 80°C required minimum time for drying (5 hrs.) followed by tray drying 70°C (6.5 hrs.), tray drying 60°C (8.0hrs.), solar cabinet drying (12 hrs.), whereas maximum drying time was required for sun drying (20hrs.). The drying rate drying time relationship was exponential with decrease in drying rate as time proceeded. Maximum value of initial drying rate was observed in tray drying at 80°C (2.88 gm/100gm/min.) followed by 70°C (2.02 gm/100gm/min.), followed by 60°C (1.92 gm/100gm/min.). Lower initial drying rate values were found in case of sun drying (0.997 gm/100gm/min.) and solar cabinet drying (0.873gm/100gm/min). The drying rate of pomegranate rind decreased with decrease in moisture content. The drying takes place in continuous falling rate period of drying. The fine characteristics of pomegranate rind powder obtained by various size reduction methods are shown in

Table 4: Effect of pasteurization temperature and preservative concentration on juice quality stored at room temperature storage.

Constituent	Fresh Juice	Preserved juice after 120 days								
		60°C			70°C			80°C		
		50 ppm	100 ppm	150 ppm	50 ppm	100 ppm	150 ppm	50 ppm	100 ppm	150 ppm
TSS	15.50	17.20	17.00	17.1	16.7	16.5	16.6	17.1	16.9	17.00
pH	3.2	3.5	3.5	3.5	3.4	3.3	3.4	3.5	3.5	3.5
Acidity(%)	0.50	0.42	0.44	0.43	0.45	0.47	0.46	0.44	0.46	0.45
Ascorbic acid (%)	0.0120	0.0078	0.0080	0.0079	0.0094	0.0100	0.0098	0.0086	0.009	0.0088
Tannin(%)	0.285	0.200	0.202	0.201	0.244	0.248	0.246	0.203	0.210	0.208
Total sugars (%)	13.50	14.60	14.50	14.55	14.20	14.10	14.15	14.40	14.30	14.35
Reducing sugars (%)	12.25	13.23	13.14	13.19	12.87	12.78	12.83	13.05	12.96	13.00
Non-reducing sugars (%)	1.25	1.37	1.36	1.36	1.33	1.32	1.32	1.35	1.34	1.35

Table 5: Effect of pasteutization temperature and preservative concentration on juice quality stored at low temperature storage

Constituent	Fresh Juice	Preserved juice after 120 days								
		60°C			70°C			80°C		
		50 ppm	100 ppm	150 ppm	50 ppm	100 ppm	150 ppm	50 ppm	100 ppm	150 ppm
TSS	15.50	17.2	17.00	17.1	16.7	16.5	16.6	17.00	16.8	16.90
pH	3.2	3.5	3.5	3.5	3.4	3.3	3.4	3.5	3.4	3.5
Acidity(%)	0.501	0.44	0.445	0.440	0.475	0.480	0.478	0.455	0.46	0.458
Ascorbic acid (%)	0.012	0.0078	0.0080	0.0079	0.0098	0.010	0.0099	0.0088	0.0090	0.0089
Tannin(%)	0.285	0.200	0.202	0.201	0.250	0.252	0.257	0.210	0.212	0.211
Total sugars (%)	13.50	14.50	14.40	14.45	14.10	14.00	14.05	14.35	14.25	14.30
Reducing sugars (%)	12.25	13.11	13.02	13.07	12.75	12.66	12.72	12.99	12.90	12.94
Non-reducing sugars (%)	1.25	1.39	1.38	1.38	1.35	1.35	1.34	1.36	1.35	1.36

Table 6. Hammer mill with 100-mesh sieve was found to be better in size reduction machine as compared to plate mill and power mixer. The fineness modulus and modulus of uniformity was found better in case of hammer mill with 100 mesh sieve. Recovery of powder obtained was 7.5% on whole fruit basis and 32% on rind weight basis. Colour analysis indicated better colour preservation with tray drying at 60°C. A yellowish brown colour dye can be prepared from the powder due to permanent binding properties. Good quality fine powder was obtained by drying at 60° to 70°C for 6.5 to 8.0 hours.

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Contd. from Page 32

Preparation of Quality Products from Potato

average score for all the sensory attributes and overall acceptability were more than 7.8. Hence, it could be concluded that the dehydrated potato products were liked very much by the consumers.

Quality of fried potato products

The acceptable potato products were fried using edible groundnut oil. The sensory evaluation of fried products was done for the organoleptic properties viz., crispness, texture and taste. The overall acceptability was taken as average of these sensory attributes and given in Table 4. The overall acceptability varied between 7.3 to 8.6 for all potato products. The acceptability of potato slices and cubes were found very good whereas the acceptability of potato sticks was found good.

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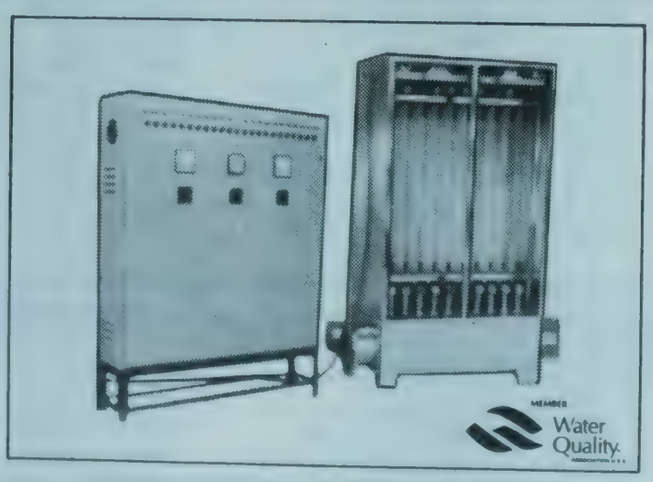

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State of the Art in Fruit and Vegetable Refrigeration Systems

by

Dr. Ing. Karl-Heinz Hochhaus

The original methods employed for the long-term preservation of highly perishable foods are dehydration, salting, sterilization and smoking. They are still used for meat, fish and some fruits. In addition, fruit and vegetables are kept cool and moist in cellars and pits in the ground, where the duration of storage depends on the keeping capacity of the product and the storage conditions. It is impossible to achieve optimal results with this simple method, so shelf-life and product quality are inevitably impaired.

Machine-cooled storage holds several benefits for farmers and producer cooperatives. It helps to keep prices up in case of crop surpluses, ensures extended storage times with good-quality results, and secures continuity of supply for customers. Refrigeration facilities are also important for transit storage at the wholesale and retail levels, where they help to reduce waste.

Coldstores with machine refrigeration

Food refrigeration can be divided into two ranges: cooling (0 to -1.5°C) and freezing (-10°C and lower). A machine-refrigerated store comprises the main cold-generating units and the applications (precooling rooms, cold rooms, deep-freeze rooms).

Principles of refrigeration

Of the various refrigeration methods available, three have stood the test of time: the cold-air refrigerating machine (with an electric drive), the cold-vapour method (electric drive) and the absorption method (heating, waste-heat recovery). Cold-air refrigerating machines were very popular around the turn of the century before the cold-vapour system took over. The absorption refrigerating machine is heated and works with ammonia as the refrigerant as well as with heat recovery, in view of the international ban on CFCs, this method is finding new applications all over the world.

Heat and power coupling makes it possible to achieve high efficiencies and low operating costs. In decentralized electric power generation using diesel generator sets, the heat recovered from exhaust gases and cooling water is also used for cooling in absorption refrigerating plants, in addition to heat recovery for warm water and heating. The combination of water and lithium bromide finds highly successful applications in air-conditioning, and that of ammonia and water in refrigeration generation down to -30°C.

The cold-vapour principle is in widespread use in places with good utility infrastructures and a reliable power supply. In these conditions, investment costs are low. This systems will now be described in brief.

Cold-vapour refrigerating systems

The refrigerating machine is a compressor. It is driven by a motor and compresses the gaseous refrigerant to a higher pressure. The compressed refrigerant then flows through a condenser and is liquified at the ambient temperature, giving off heat. The liquid refrigerant is then reduced to the low pressure in a flow-control valve (expansion valve) and now seeks to evaporate. The evaporation temperature is very low, and the vaporization heat removes the refrigerant from the cold room with the help of the evaporator (Fig.1). Heat transfer is improved and speeded

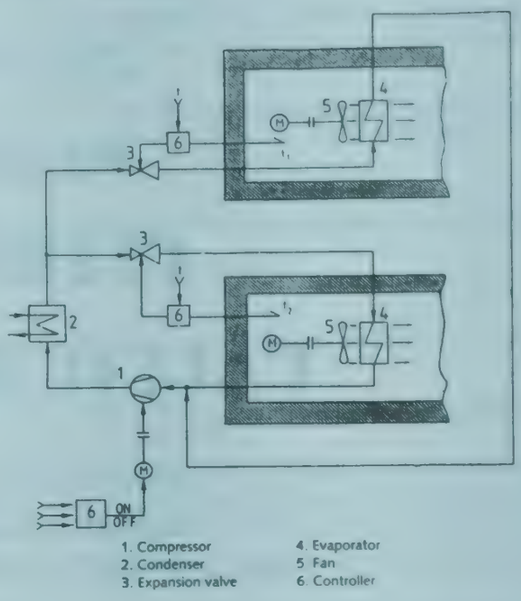

Fig.1 Refrigeration machinery (direct) for two coldstores

up by providing the evaporator with fans on the air side to enlarge its surface area, and a fan is often used to increase the air flow rate. The refrigerant does not leave the evaporator until it is completely vaporized. In this state it is aspirated by the refrigerating machine, thereby completing the refrigerant circuit. In the cold room, the fan improves the transfer of heat from the air to the evaporating refrigerant and mixes the air very thoroughly to ensure an even temperature distribution.

Coldstore operation

The cold-room temperature is set on the thermostat; the switching differential (hysteresis), i.e. the difference in temperature between the compressor cut-in and cut-out points, can be adjusted. The relevant switching differentials for fruit and vegetables stores are between 0.5°C and 1.5°C. High differentials from 1.5°C to 2.5°C reduce the electricity consumption but causes additional pressure and humidity variations. In CA stores, the permissible switching differential depends on the quality of the chamber insulation. Thermometers calibrated in tenths of a degree are necessary to check the thermostat temperatures and settings. Hygrometers measure the relative air humidity. These instruments must be carefully maintained and recalibrated at regular intervals. Humidifiers, evaporator fans and defrosting facilities can easily be fitted with automatic on/off time switches at little cost, as required.

Large machine-cooled coldstores

Coldstores with several cold rooms are often equipped with a combination refrigeration plant featuring several refrigerant compressors. The compressors are interconnected on the suction and pressure sides, and individual compressors can be disconnected according to the refrigeration capacity required (incoming crop, high outside temperature, 100%, normal operation, low outside temperature 20-50%). Where the refrigerant is ammonia (NH_3) a cooling agent (brine, glycol) is used, which is located in an addi

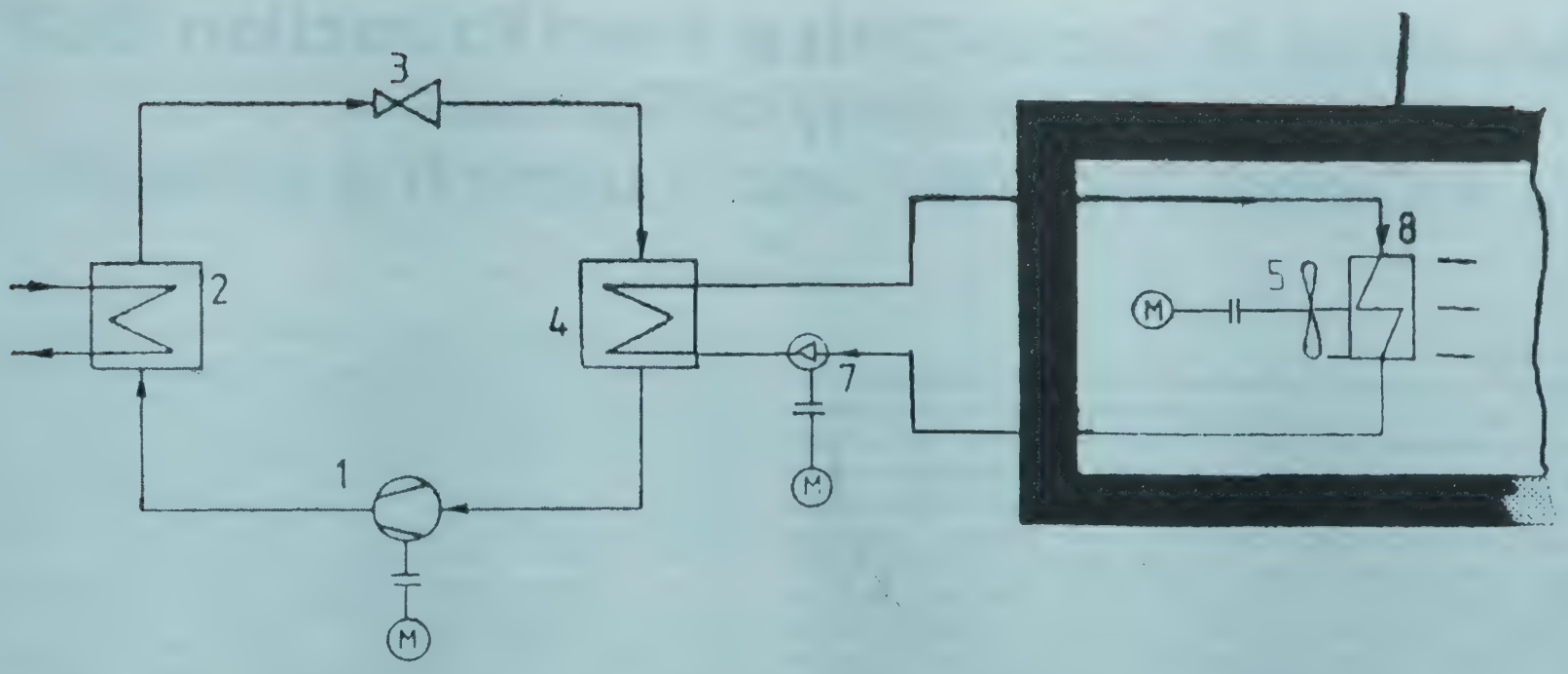

Fig. 2 Refrigeration machinery (indirect) with brine system between the refrigerant circuit and the coldstore circuit

tional system with circulating pumps between the refrigeration plant and the cold room (Fig. 2). Stepless temperature adjustment avoids pressure fluctuations in the cold room. These plants often feature a built-in ice accumulator, making it possible to run the power-intensive compressors at night, when power supplies may be more reliable and electricity costs are lower.

Controlled atmospheres

Historians tell us that the Ancient Egyptians and Chinese were using a form of "controlled atmosphere" (CA) storage in large silos thousands of years ago. These systems worked by lowering the level of oxygen (O_2) in the air of the storage chambers and raising the carbon-dioxide (CO_2), content, thereby keeping the contents of the store-house good for longer periods. The process killed off many pests or reduced their level of activity and reproductive capacity. In our century, this storage technology has been greatly improved and refined with a variety of methods such as catalytic combustion, pressure swing absorption (PSA), membrane technology, CO_2 scrubbers and ethylene converters and combined with machine-cooled coldstores. Since the 1950s, controlled-atmosphere technology has spread rapidly across the world, leading to extremely long storage times in case of certain fruit and vegetable varieties.

Arrival storage and precooling

The size of the farm supplying the produce, the extent of the crop and the distance to the coldstore are important factors affecting storage at harvest-time. It is essential to get fruits and vegetables into store and bring the temperature down as quickly as possible. This is particularly true for produce with a short keeping capacity. The quicker the produce is cooled to the optimal temperature, the better the quality will remain. It is good practice to do the harvesting and transportation after midnight, not in the full heat of the day. As very rapid cooling is not possible in ordinary coldstores, other methods are used in special fixed or mobile precooling facilities. Vacuum precooling is used for fruits and vegetables with the large surface areas. In cold-water cooling, the produce is fed through a covered tunnel and cooled with finely atomized cold water sprays. Cold-air precooling uses substantially higher air speeds and wider spacing between the boxes than is the case in a regular coldstore. This method requires more and stronger fans and heavy-duty air coolers.

Courtesey: ***Fruit World '97***

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Advances in Super-Critical Fluid Extraction (SCFE) Technology of Spices — *A Global Overview and Future R & D Needs*

by
J. S. Pruthi

Abstract

Spices which are consumed mostly in flavouring of innumerable foods, are gradually gaining considerable economic/commercial importance as is evident from recent world trade in spices (256,000 tons worth about 1.5 billion US$). India is one of the major spice producing/exporting countries as is evident from the export earnings of over Rs.1860 millions during 1999-2000. (see Table 1) Because of the several built-in defects in the use of whole or ground spices, such as (a) variable flavour strength (b) presence of polyphenols etc. which could discolour some manufactured food products (c) slow release of flavour (d) Microbial contamination, etc. Spice oleoresins, spice essential oils, and other spice extractives are now being used commercially in sophisticated food products in place of ground spices. India, again, is one of the leading countries producing and exporting abut a dozen important spice oleoresins about Rs.120 crores worth), but these oleoresins are being produced by use of organic solvents, the use of some of which is now, prohibited in spice importing countries like UK, USA and Germany. Likewise, steam-distillation too affects adversely the basic quality of essential oils, notably the low-boiling volatiles. To overcome these built-in defects, super-critical fluid extraction (SCFE) process provides an excellent new and versatile alternative for the extraction of spices. This paper presents a global review of the numerous R & D efforts on SCFE of (a) about 47 spices viz Ajowan, Allspice (Pimento) Angelica, Aniseed,Basil, Calamus, Capsicums, Caraway, Cardamom(small and large) Cassia, Celery, Chives, Cinnamon, Clove, Coriander, Cumin Black, Cumin, Dill (Indian Sowa), European dill, Fennel, Fenugreek, Garlic, Ginger, Hyssop, Juniper, Lovage, Mace, Marjoram, Mustard, Nutmeg, Qnion Origanum, Parsley, Pepper Black, Peppermint, Poppy Seed, Rosemary, Savory, Star-anise, Tarragon, Thyme, Turmeric and Vanilla etc. (b) Spice Essential Oils and (c) Spice Oils. The commercial SCFE plants in use in some of the developed countries like Germany, Canada, Australia, etc. and other related commercial SCFE activity areas have also been reviewed. At the end, the future scope of the SCFE process and R & D needs have been highlighted.

Introduction

There are about 86 spices grown in the world and traded internationally worth US$1.5 billion! India grows about 50 of them and through the export of only about 20 spices, India earned Rs. 1860 crores during 1999-2000.This includes the export of value added spice products namely spice essential oils and oleoresins worth Rs. 285 crores.Oleoresins need special attention. (Table 1) Hitnerto, they are manufactured commercially by using organic solvents, some of which are now considered carcinogenic and hence are banned in some importing countries like USA, UK and Germany, etc.The SCFE process should prove a boon since it will not only solve this problem but will also further improve the quality of oleoresins of which, India is the largest producer and exporter.Thus, researches in the SCFE of spices and spice products needs immediate attention of the concerned R & D organisations and researchers all over the world, since there is considerable scope for SCFE Technology in these areas.

The 47 spices researched upon during the past over 25 years arranged alphabetically are Ajowan. All spice, Angelica, Aniseed, Basil, Calamus, Capsicums, Caraway, Cardamom (small) Cardamom (large), Cassia, Celery, Chevil, Cinanamon, Clove, Coriander, Cumin, Cumin black Dill (European), Garlic, Ginger, Hyssop, Juniper, Lovage, Mace, Marjoram, Mustard, Nutmeg, Onion, Oregano, Parsley, Pepper (black), Peppermint, Poppy Seeds Rosemary, Sage, Savoury, Tarragon, Thyme, Turmeric and Vanilla.

This paper presents a global review of numerous R & D efforts made on the SCFE of:(a) 47 spices (b) spice essential oils (c) Oleoresins & (d) major Chemical Constituents as follows:

1. Ajowan Seed

Ajowan seeds were extracted with liquid carbon dioxide at 60 bar pressure and different temperatures. Percent yield of the extracts were calculated. Both the quality and percent yield of Ajowan essential oil were compared with those of the oil obtained by steam distillation(3.08%).The LCO_2 oil was better in quality and higher in yield (27a-b). Low temperature extraction was found to be favourable.

Temp. (°C)	Time Minutes	Yield (%)
10	30	5.01
15	30	3.81
25	30	3.07

Ajowan oil extraction at 25°C and 60 bar extraction pressure gave lower yield of oil/extract, though it had higher content of thymol, the major active principle (27a-b). Gas chromatography of ajowan seed oil shows better yield of high boiling constituents i.e. oxygenated terpenes and sesquiterpenes, etc. and less terpene hydrocarbons, but in steam distilled oil,the trend was just the reverse i.e. more yield of low boiling constituents and less of high boiling consitutents (27a-b).

To conclude, there is need for further researches into determination of optimal parameters of temperature and time of extraction in relation to pressure. in order to get optimal yield with high thymol content.

2. Allspice or Pimento

Moyler (1987) used liquid and supercritical CO_2 for the extraction of the essential oil of Pimento or Allspice and 8 other spices (Cardamom, clove, ginger,juniper, mace, nutmeg, pepper and vanilla) and reported (a) Minimal changes in or degradation of the essential of (b) properties of L. CO_2 extracts, (c) advantages of L.CO_2 extraction over other extraction techniques[27]. Moyler (1993) reviewed the SCFE of 32 spices including all spice[7]. Calme and Steiner

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(1987) reported a yield of 5.3% from all spice by extracting with L.CO_2 at 300 bar and 40°C, using ethanol entrainer, with subsequent separation at 55 bar and 37°C, while only 2.5% yield was obtained by steam distillation [13]. A yield of 4.5% was obtained from all spice directly at low temperatures between 0-10°C [78.13]. Analysis of spice essential oil has been reviewed by Lawrence, covering all important aspects thereof.

3. Angelica

The chemistry/chemical composition of angelica seeds has been reviewed[5,6, 31]. It contains many of the components of angelica root oil which also has been reviewed [32-34].It has also been proved that seed and root oils can clearly be differentiated by studying the enantometric ration of alpha and beta pinenes on chirar column two-dimential chromatography. The rations are quire reversed [33].

The reported L.CO_2 yield is 3.0% as compared to 0.3 to 0.8% by steam distillation [7]. The minimum perceptible limit reproted is 0.02 mg% (0.2 ppm). All important aspects of Angelica oil have been reviewed [32].

4. Aniseed or Anise

The SCFE of aniseed oil gave an oil yield of 7% at a pressure of 300 bar and 40°C for extraction and a subsequent fractionation at 75 bar and 40°C, as compared to only 2.1% by steam distillation [13].

The aniseed oil has been reviewed in fair detail by Lawrence [34], German researchers [35,36] and Russian workers [37]. Further work[13] on S.CO extraction of different batches of aniseed with hexane as an entrainer, gave similar results.

5. Basil or Sweet Basil (*Tulsi*):

The SCF extraction of basil oil was first reported by Pekhova, ***et al:*** [38] in Russia, who compared it with steam distillation of East Indian Basil oil. For Basil oil capillary SFC(Supercritical fluid chromatography) seemed to give more, reliable quantification than CGC(Capillary Gas Chromatography), especially for the oxygenated compounds. The separation efficiency of CGC for monoterpene hydrocarbons, was, however, much better than that of SFC, [39]. At pressure of 200 bar and 40°C, SCF extract of basil leaves was obtained which was later fractionated at 56 bar and 15°C to yield 1.3% of essential oil as compared to 0.5% by steam distillation of the same batch of basil leaves [13]. The analysis of basil oil has reviewed several times by Lawrence [40] during 1977 to 1986.

6. Calamus or Sweet Flag

The earlier work of Calamus has been reviewed [41]. The comparative differences in the decomposition or degradation of the Calamus essential oils (determined by GLC) obtained by liquid CO_2 extraction or steam distillation are highlighted. Besides, [2] the basis of principles,(b) advantages of utilizing high pressure gas extraction and (c) solvent properties of liquid CO_2 extraction have been described.The same authors have also reported the SCFE of cardamom and major oils[41].

7. Capsicums/Chillies/Paprika:

Using SCFE process, Tiwari (1989) reported the extraction of capsaicin to the tune of 97% from Indian Chillies. To the 3 spices studied (chillies, ginger and pepper) for the extraction of corresponding spice oleoresins, the temp. range of 40°C to 55°C and pressure varying from 200 to 400 bar[19]. Liwuid CO_2 at-22°C was used by the Russian(KNIPP) researchers to extract Indian red chilli peppers [38,42]. The other researchers [43-44,16a 66a] also reported on the liquid CO_2 extraction of chillies. The SCF Extract yield obtained was 4.9% as compared to only <0.1mg% or 0.1ppm.The major component reproted was capsaicin [7, 13, 16a, 56a].

8. Caraway

The L.CO_2 extracted caraway, coriander, aniseed & fennel were used for the first time in 1974 for flavouring Ryebread [45]. Stahl and his associates 935-36) conducted detailed studies on SCF extracting of caraway seed at 90 bar and 20°C followed by fractionation of the essential oil at 30 bar and 0°C. The yield reported for steam distillation was 4.1% and that for $CO._2$ extraction/hexanes was 14.1%. Studies have also been reported to SCF of Caraway[13]. Reviews on caraway oil have been reported by Lawrence [46].

9. Cardamom Small (*E.cardamomum*):

The earliest report on the use of liquid CO_2 for the extraction of small cardamom was in 1969 in Russia[47]. L. $Co._2$ at 20 0°C and 59 bar was used to extract small cardamom, celery, clove, coriander, laurel, and nutmeg. Researchers at KNIPP reported [48] on the comparison of L.CO_2 and steam distilled oil. A comparative analytical study of the quantitative composition of CO_2 extract compared to hexane extract and steam distilled oil has been reported along with comparative yields and non-volatile constituent [49]. The same authors [50] reported the influence of the 4 important extraction parameters viz. pressure, temperature, time of extraction and moisture on the yield and composition of the cardamom oil obtained by liquid CO_2 extraction. The yield of cardamom oil extracted was found to be fairly constant under different conditions of extraction but the non-volatiles and chlorophyll contents varied in the extracts with different parameters (Table 1). The proportion of and major components also showed variations as under:

The reported yield of L.CO_2 extract was 4% and that of steam distilled oil as 4-6% and the minimum perceptible level: 0.05 mg% (or 0.5 ppm) [13], but according to a recent report[51], the corresponding figures were 9.4% (on 2.5 hrs. extraction) and 9.0% on 5 hr. steam distillation, but according to a more recent report, the % yield varied from 7.5 to 7.9% by LCO_2 extraction. These variations in yield may be due to variations on the quality of raw material used. Other reports [27:41,16a 56a] also cover cardamom oil extraction by LCO2. A detailed fingerprint of cardamom oil has been reported [52] and it analysis reviewed [54-55].

Table 1. Yield and Characteristics of Cardamom Extract Obtained by SC CO_2 (50)

Particulars	*a* Pressure (bar)						*b* Temperature (°C)			*c* Extraction C Time (hrs)				*d* Moisture (%)		
	100	200	300	400	500	600	40°C	50°C	60°C	0.5h	1h	2h	3h	10%	20%	30%
Yield of oil%	7.6	7.5	7.9	7.5	7.8	7.6	7.8	7.8	7.8	7.6	7.6	7.7	7.8	7.8	7.6	7.6
Residual oil%	0.6	0.8	0.6	0.6	0.5	0.6	0.5	0.7	0.4	0 5	0.6	0.6	0.5	0.6	0.7	0.7
Nonovaltiles%	4.5	5.4	7.0	8.8	9.5	9.4	9.5	8.8	9.2	9.3	9.5	9.5	9.5	9.5	9.4	10.0
Chlorophyll .ppm	18	29	38	53	90	93	90	85	85	40	90	90	90	90	90	81

Optimal Valves: (a) Pressure 500 bar (b) Temp. 40°C (c) Extraction Time 3hrs. (d) Moisture 10% (Average of 3 observations)

10. Large Cardamom (*Am.subulatum*).
As per survey of literature, only one report on the liquid CO_2 extraction of large cardamom (Am. Subulatun) has appeared recentlyl [56,56a] about 2.3% by steam distillation. The essential oil composition of both the oils from the 2 processes have been compared by TLC and GC analysis for the identification of the major constituents. Earlier, the chemistry and technology of Am. Subulatum and its oi) were studied and reviewed [1,4,6,57].

11. Cassia Bark (*C.cassia*)
The reported LCO_2 extract yield of cassia bark is 0.6%(60 bar and 70C) as compared to 0.2 to 0.5% by steam distillation and the minimum perceptible level: 0.2mg%(or 2 ppm) [1,13].The LCO_2 extract of the powdered bark is a mobile oil without the dark coloured waxes and resins normally encountered with the bark oleoresin prepared with chemical organic solvent. The LCO_2 selective extract is more soluble in foods, when the resinous components have slight fixing effect on the flavour components of cassia bark extract [7,13]. The cassia oil has been reviewed[58].

12. Celery (Seed)
Celery seed (ground) is extracted selectively with $L.CO_2$ to give the best olefactory yield of 3%. However, continued extraction with , $L.CO_2$ or $S.CO_2$. can yield an extra 10% of seed lipid. There lipids only save to liberate the active components. The oil contains all the available active natural chemical compounds together with the minimum of saturated, stable low-molecular weight non-polar lipids compared to the steam distilled oil which contains very high levels of limonene [59-61]. The yield of steam distilled oil varies from 2.5 to 3.0% as compared to 3% by LCO_2 extraction technique. The minimum perceptible limit is 0.2mg% or 2 ppm [13]. The composition of the seed oil has been reviewed [62]. Differences in the aroma compound composition of the essential oil distillates and supercritical extracts of six spices namely celery leaves, coriander and cumin seeds, marjoram, parsley leaves and peppercorns, are described[63].

13. Chives
Sulphur compounds in fresh and dried minced chives garlic and onion were monitored by supercritical fluid extraction (SFE) combined with GC-Akaonic detection (AED). All the samples were extracted with CO_2 (Density 0.75g/cm^3). Dried minced onions and chives contianed 50-100% lower concentration of compounds than those garlic[64].

14. Cinnamon (Bark) (*C. zelanicum*)
The SCF extraction of cinnamon bark powder has been researched by a numner of researchers [13,35,65-66] and reviewed [7,67]. Coorsely ground cinnamon bark was extracted with supercritical CO_2 in commercially available equipment at 50^{0}C using pressures of 300, 400, 500 & 600 bar and to obtain oleoresin and essential oil from the same material by refluxing with CH_2 CL_2 and water distillation respectively [65]. The chem. composition of the extracts, oleoresin and essential oil was determined by G.C.[65]. A method was developed for the extraction and analysis of flavour and fragrance compounds of natural products(like cinnamon, rosemary and thyme, etc) by SCF extraction with CO combined with capillary GC[66].

The use of liquid CO_2 at 25^{0}C-60^{0}C and 65-400 bar-(conditions so wide ranging as to be outside the liquid CO2 range) has been patented [35]. The obvious intention is to use supercritical extraction to remove the oleoresin and subsequent sub-critical CO_2 fractionation of the oil[7]. The most detailed results are reported [13]. No great differences were reported sensorically between the steam distilled oil and extracts [7,13].The reported $L.CO_2$ yield is 1.4% [13] as compared to that of steam distilled (0.5 to 0.8%) and the minimum perceptible level is 0.2mg% or 2ppm.

15. Clove Flower (Bud)
Several researchers have reported upon the application SCF extraction to clove [13,27,32,56,68-72] and composition/analysis of clove bud oils have also been reviewed [73-75]. Various densities of supercritical CO_2 were evaluated in terms of their ability to selectively-extract the components of ground clove buds. The extracts were recovered by using either a direct on-column interface or solvent recovery and an ion-trap GC/MS system was used for solute separation and identification [71].

The on-column interface system provided (a) optimum component selectivity with minimum time for analysis (b) method development and (c) greater potential resolution. These capabilities are particularly valuable for trade and volatile constituent analysis of complex natural products [71]. A yield of 20% in two hours was reported for the $L.CO_2$ extraction of the clove buds at 60 bar and 20^{0}C as compared to 18% by steam distillation[32,56 a,68,69]. Detailed SCF extraction of clove bud oil has been reported recently from India[70]. The comprehensive review of clove[73] and composition of clove oil has been regularly reviewed [75]. The analysis of clove bud oils from diff. growing regions has also been published [74].

16. Coriander (Seed)
Application of LCO_2 to the extraction of essential oil from coriander seeds has been reported and its comparison with hydrodistilled coriander seed oil has been made and 40 of the compoudns have been identified [76]. The L.C.yield reported is 3% at 50% lipids; SCO_2 yield=103% fractionated[13] and yield of steam distilled 0.5% to 1%. The minimum perceptible limit is 0.05% or 0.5 ppm.

A very detailed study[77] revealed 203 components in coriander oil, 23 of which were oxides, furans and acetals, were phenols and 15 were nitrogen containing. LCO_2 extract of seed continue about 50% of low molecular weight saturated stable lipids [52]. This is the equivalent of 1.5% volatile oil from coriander. SCO_2 oleoresin extract, when fractionated (13%) to separate lipids, gave 1.3% of volatile oil. A comparison of CO_2 extracted, soxhlet solvent extracted and steam distilled oils has been published [78] and reviewed [79] and also the composition coriander oil[80].

17. Cumin(Seed)
The first research report on the LCO_2 extraction of cumin seeds appeared in 1972[81]. The quantitative SCF extraction of cumin oil in a shorter time than that for steam distillation, without loss of active flavour components was later reported from India [51,56a]. These authors showed that at 58 bar and 20^{0}C, LCO_2 yielded 4.5% oil in just 2 hours as compared to 2.5% by steam distillation for 4 hours[51,56a]. Cumin oil has been reviewed [82].

18. Black Cumin Seed
Naik (1989) conducted exhaustive studies on liquid and SCF extraction of black cumin (Nigella sativa) among with the 12 other spices and other natural products [16a]. The percent yields of essential oils with different extraction times for black cumin were determined in liquid CO_2 extraction and a mathematical equation for calculating the percent yield has been suggested. The yield obtained by liquid CO_2 extraction was higher than that obtained by steam distillation.The time and energy requirements in LCO_2 process are much less than that required in steam distillation process. TLC/GLC studies revealed that LCO_2 extracts had less monoterpene hydrocarbons. Carvone.

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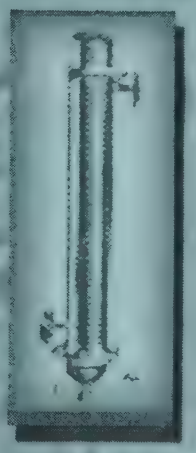

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limonene and cymene were the major consitutents of black cumin oil [16a,56a].

A method is described for drying of SCF extracts of natural products like Dill(European, Parsley and Taragon, obtained by high pressure extraction with liquefied gases or gas in supercritical state [83].

20. Fennel (Seed)

The use of LCO extracted fennel oil, and aniseed, caraway and coriander oils in rye-bread as an other alternative to the ground spice, has been reported [81]. LCO_2 extraction of fennel seed (ground) gave a 5.8% yield of oil in 2 hours at distillation for 5 hours [51,56a]. The analysis of fennel oil has been reviewed [84].

21. Fenugreek (Seed)

The LCO_2 extraction of ground fenugreek for 2 hours gave about 2% yield of an intensely rich flavoured oil with all the active components of the spice. Steam distillation for 4 hours yielded 2.5% oil[7]. As with all fenugreek extract, it is recommended that an oil soluble antioxidant such as alpha-tocopherol is added if the extract is to be stored, since the fenugreek lipids seem sensitive to oxidant during storage[7]. Fenugreek oil has been reviewed [85].

22. Garlic (bulb)

Not much reported/published information is available on the SCF extraction of this important spice which has natural antibiotic property[7]. However, a method and equipment for microwave extraction of volatile oil, using a supercritical fluid, have been patented [86].A microwave application is used in which the material and the extractant (i.e. super critical fluid) are combined. the oil is separated from the parent material(using filtration, evaporation and condensation. The resultant oils can be purified by a second microwave extraction. The used extractant can be re-cycled[86].

23. Ginger

1) ***Indian Ginger***: SCO_2 extraction of ginger,has received considerable global attention. Super-critical CO_2 ($SC0_2$) extraction of dried powdered rhizons of Indian ginger and aromaprofile for ginger constituents have been provided (87), SCO_2 ginger extract obtained y total commercial SCO_2 process,had the highest gingerol/shogaole ration and olfactory curve closest to that of the original parent ginger rhizome. The SCO_2 ginger extract received favourable results [87] when used in several cooked dishes(soup,fish and poultry). The yield of SCO_2 extract after 2 1/2 hour extraction was 3.7% as compared to 1.6% after steam distillation for 6 hrs[51,18,19]. At temperature lower than 10^0C, the extraction yield is lower and the profile of components more selective. This LCO_2 lower temp. extracted. give no further components on team distillation [51].

ii) ***Jamaican Ginger***: Rates of extraction of gingerol[6] from ground dried Jamaican ginger rhizome were determined in SCO_2 over the pressure range of 128-147 bar (1850 to 2850 psi) and temp. range of 50^0-65^0C. CO_2 densities varied from 0.45 to 0.775 cm^{-3}.

iii) ***Nigerian/African Ginger***: The LCO_2 extraction of Nigerian ginger rhizome gave a yield of 3% and SCO_2 has been reported to give 4.6% [13]. Much is depended in the fractionation of the SCO_2 extract/oleoresin, as organic solvents like acetone give 7%.

iv) ***Chinese/Taiwan Ginger***: Taiwan Ginger oil extracted using a liquid CO_2(600-700 psi) extractor was analysed by TLC on silica gel and HPLC on a reverse-phase column. Comparative studies indicated that ginger extract obtained by LCO_2 extraction possessed both pungent and aromatic properties of ginger [89-91]. The yield of oil was 3.44% w/w in LCO_2 extraction [90]. The purgent compounds were isolated and further studied with regard to their formation and degradation. Liquid CO_2 extraction at low temp. does not result in ginger oil degradation. On the contrary, steam distillation results in the retro-aldol and retro-clasen Schmadt degradation of non-volatile gingerol compounds and hence has an adverse effect on the flavour quality of ginger[91]. Liquid CO_2 gave 88% recovery of the pungent compounds in ginger oil[92]. The pungent gingerols identified were in 2 categories i.e. even numbered e.g. 10, 12, & 14-gingerol) and metrylated gingerols[92].

Freeze-dried ginger powder has extracted with liquid CO_2(600-700psi) for 48 hours. Volatile components were fractionated and their gas-chromatographic analysis (by capillary GC, GC-MS etc) conduced. Out of 168 characterised compounds 90 were identified and 58 tentatively identified and the effects of LCO_2 extraction upon the volatile composition of ginger oil were discussed [93]. The analysis of ginger oil has been reviewed [94-95].

24. Hyssop

The ethanolic extract of Hyssop was separated into fractions through-extraction with super-critical CO_2 for the separation of the most active antioxidant naturally present in hyssop. Rosmanol-9- ethyl either was found to be one of trhe active antioxidant components present both in Hyssop and Sage,with antioxidant activity much greater than that of BHT[96].

25. Juniper Berries

The first report on SCO_2 extraction of Juniper berries was from Russian Scientists published in 1978[97]. Comparative merits LCO_2 extraction Vs. steam distillation are discussed [27,72].The organoleptic properties and GLC composition of SCO extracted juniper berries have also been reported [61,98,99]. Juniper berries with 1.47% oil content by steam distillation, gave a yield of 7.2% after SCO_2 extraction with hexane entrainer and subsequent fractionation at 52 bar and 11^0C in the sub-critical mode. The detailed fingerprint GLC analysis of juniper berry oil from Hungary has been published [100]. Besides, the published analyses of juniper berry oil has been reviewed[101].

26. Lovage

Studies on the extraction yields of lovage with variety of solvents have been reported but unfortunately, SCO_2 was not included [102]. However, from the polarity of solvents used in this study, it is possible to predict that all active components would be extracted from lovage with LCO_2(7). Two major studies by Toulemonde et al. who comprehensively and quantitatively elucidated the 15 phthalides present in lovage [103] Besides the compositions of lovage root and leaves have also been reviewed [104].

27. Mace

The first report on the SCO_2 extraction of mace was published as early as in 1967, stating that it contained non-steam-components,but was suitable for food applications [27,41,105]. The yields of 16.5 to 18.5% have been reported for $L.CO_2$ extraction at 60 bar and 20^0C as compared to 15% by steam [56a] However, this yield is variable and is dependent on batch of the spice, and it is possible to extract upto 50% of low-molecular weight of lipids [106]. The composition of a typical $L.CO_2$ extract is 38% monoterpene hydrocarbons, 6.1% elmicin + myristicin, with desirably low levels of only 0.8% paracymene and 0.1% of alpha terpineol. The safrole content of mace oils and extracts is source dependent [107]. For example, W.I.(West Indies) spice has a low content of this undesirable component, while E.I. spice has upto 20 times that amount [7,106]. Detailed review on

Mace has been published [107].

28. Marjoram

The influence of the method of extraction on the composition of the flavour extract from marjoram has been investigated [108] viz(i) terturation of marjoram leaves under liquid N2 (ii) extraction with SCO_2 and (iii) direct injection of the oil of the extraction with SCO_2 and (iii) direct injection of the oil of the individual secretory cells demonstrated that Cis-sabinene hydrate and its acetate are the original flavour compounds of the intact leaf. Satisfactory flavour extracts may be obtained by carefully controlled extraction with SCO_2 which could maximise the content of Cis-sabinene hydrate and minimize that of terpinen-4-01 [108]. Likewise, the influence of the extraction conditions of CO_2 high pressure extraction on the composition of the headspace gas and odour of the marjoram extracts has been studied in detail [109] Extraction of total lipids from marjoram, using SCO_2 and its effect extraction of total lipids from marjoram, using SCO_2 and its effect on lipid solubility, fatty acid composition and storage stability of the lipid have been published [110].

The differences in the composition of marjoram oil obtained by SCO_2 extraction or steam distillation have been reported [13,41,63] and reviewed [111]. Marjoram can be extracted with SCO_2 at 150 bar and 40°C to yield an extract which can be further fractionated at 50 bar and 35°C to give a yield of 1.7% oil comparable to yield and composition of the stem distrilled oil[13].

29. Mustard

The preparation,of defatted mustard by extraction with super critical carbon dioxide has studied [112]. No other reference on SCO_2 extraction of mustard has come to this reviewer 1notice fill 1993 end. Particularly, yellow/white mustard need the attention of researchers, since it is in great demand in India and overseas for the manufacture of several commercial mustard products like Mustard (paste), Compounded mustard, and mayonnaise, etc.

30. Nutmeg

The first report in 1973 on LCO_2 extracts of nutmeg kernels showed high stability in glass, tin and polythene containers [113]. A yield of about 16% was obtained form nutmeg kernels by LCO_2; the extract obtained containing 40% by weight of low molecular weight saturated and stable lipids [56a,106]. As al reported above for mace, a comprehensive review on nutmeg has already been published [107], so also on other analytical studies on nutmeg [114]. Liquid SCO_2 has been used for extraction essential oil from nutmeg and other spices for application as flavour and fragrances for food industries [27].

31. Onion

During the recent survey of literature, this author could locate only one references on the SCFE of onion (64). Sulphur compounds in fresh and dried minced onion were monitored by SCO_2 extraction with GC-atomic emission detection (AED). The dried onions contained lower concentration of S compounds than those in garlic.[64]

32. Oregano

The work done on SCFE extraction of oregano is rather scanty [13,102]. The SCO_2 yield of oregano was found to be 5.4% as compared to 3% by steam distillation [13]. Due to many varieties of oregano, careful sourcing and classification is required. Details of the variation in composition of oils from several sources has been reviewed [115].

33. Parsley

Differences in the aroma compound composition of essential distillates and super-critical CO_2 extract of possibly leaves and 5 other spices are described. SCO_2 extracts/ oils were far superior to the distillates. The presence of possible toxic compounds of low volatility in super-critical extracts of turniprooted parsley are also discussed (63). A method is described for drying of parsley extract obtained by high pressure extraction with liquefied gases in the super-critical state. The gas stream is charged with a drying agent, preferably calcium sulphate in powder or granular form [83].

The LCO_2 extraction of parsley seeds at 58 bar and 20°C gave an oil yield of 9.8% in 2 hours compared to a steam distillation yield of 2.7% in 5 hours [16a,56a]. These very authors reported that 30 peaks were detected in the GC of parsley seed oil if a lower temp. of extraction (14°C) was used compared to 19 peaks for 20°C extraction. They, however, have not suggested any reason therefor [16a,56a]. The various analytical aspects of parsley seed oils have been revised [116].

34. Pepper Black

Black Pepper, the most important spice in world trade and so also the most important spice of India, has received the maximum attention as seen from about 20 papers which are briefly reviewed earlier [117] and in detail as under: It covers both less pungent pepper of Sarawak and Malaysia and more pungent and fragrant pepper of India and Sri Lanka.

The SCO_2 extraction of pepper oil at conditions below 100 bar and followed by the oil separation at 55 bar and 20°C [13,118]. They also obtained 4.4% yield by extracting the oil with hexane entrainer at 100 bar and 60°C [118] and a GLC comparison made with steam doctilled oil. Udayshankar [119] described the extraction of pepper oil with SCO_2 and postulated a method for evaluating the quality of extracted oil. The extraction and analysis of pepper oil has also been reported [60]. The analysis of pepper oil has also been reported [60]. The standardized finger print GLC analysis of pepper[100] and also review on pepper has been reported [120].

Preparation of black pepper (Sarawak) oleoresin by extraction (20-25°). Essential oil recovery is maximum at 80 bar, 30°[121] Piperine increases with increasing pressure. Addition of 2% ethanol increases both essential oil and Piperine recoveries to more than 90%. An Oleoresin yield of 12.4% may be achieved at 80 bar, 30°C with addition of 2% ethanol. Oleoresin contained 42.2% pierine [121].

The first report on the SCO_2 extraction of pepper appeared in 1967 in USSR [122], which was later confirmed in 1971[123]. Vitzthum and Hubert (1922) patented [124] a process of dry SCO_2 extraction of pepper with subsequent wet CO_2 extraction of this extract to give 7% field of yellow solid [1267]. They also reported [125] on aroma extraction with LCO_2 at 25-60°C and 65 to 400 bar after SCO_2 extraction of resin.

The effect of pepper corn maturity on the piperin content of extract was reported [126]. The analysis of Indian black pepper was also reported [127].

The quantitative extraction of piperin and oil at 60°C and 300 bar for 3 hrs. was reported [118]. A 2-stage extraction [13] was used at 100 bar and 60° using hexane as entrainer at 20g/kg CO_2. After separation at 53 bar and 25°C, the oil was separated yielding 1.4%. The residue was extracted at 300 bar and 60°C with ethaneol entrainer at 26g/kg CO_2. A viscous, yellow mass of 6.5% yield was obtained, which was assayed at 90% piperine by UV determination at 343 nm.

Pepper Oleoresin obtained by SFE (at 8 or 10 MPa/4°C or 60°C) and conventional steam distillation/solvent extraction techniques are comapred and results tabulated [128]. The piperine content of black pepper oilobtained by SFE was higher and its odour and colour were better than

those of the oil extracted conventially [128]. The paper also covers ginger oil and Oleoresin as briefly reported earlier under ginger. The SCO_2 extraction of Pepper, pepper essential oil, and preperine have been investigated [129].

Extraction of pepper aroma by SCO_2 process was investigated under the following SFE conditions : (i) Temp: 40°C (ii) pressure 200 kg f/cm²; (iii) 5% methanol added to mobile phase and (iv) extraction time: 60 min. The yellow oily extract was rich in aroma, while the residue had not only aroma but also pungency. The aroma fraction was further analysed by SCF and reverse phase HPLC. Results are presented [130]. The ozone tratment for peer and other natural products using gaseous or super-criticial-ozone & super critical extraction of black pepper (improved yield and quality of pepper oil) reduces bacterial load [131].

35. Peppermint

Capillary SFC (Super-critical fluid Chromatography) was applied to the analysis of pepermint oil-a complex mixture. [39] Results were compared with those obtained by capillary GC (CGC). For peppermint oil, CFC seemed to give a more reliable quantification than CGC, especially for the oxygenated compounds. The separation efficiency of CGC for monoterpene hydrocarbons was, however, as expected much better than SFC[39].

36. Poppy Seed

Literature survey showed only one reference and that too from India [56a]. The milled poppy seeds were extracted with L.CO_2 under liquid Vapour conditions. The yield and extraction for poppy seeds were 2.5% w/w and 2 hours respectively [56a]). However, chemical constitutents of poppy have not been reported nor the steam distillate obviously more R & D work is needed.

37. Rosemary

A recent study [132] reproted a 2.70% of S CO_2 yield at 300 bar and 35°C together with a capillary GCMS analysis of oil. The optimum conditions for essential oil extraction from rosemary were at 90-100 bar and 40-45°C.

Chemical analysis of both SCF extracted and hydrodistilled rosemary oils revealed that although both types of oils had generally the same compounds, but were widely varying in concentration [133]. The aroma of the SCF extracted oil more closely resembled the natural rosemary leaves than did the distilled oil. Steam distilled rosemary oil yield was 1.44% (118) as compared to SCF extracted rosemary oil (0.75%) extracted with ethanol or hexane as entrainer at 250 bar and 60°C with subsequent separation at sub-critical conditions of 53 bar at 12°C[118].

The effects of super-critical CO_2 extraction (SE) on the chemical compostion fo oleoresin from rosemary were investigated using GC/MS techniques [134]. SE resutled in better oil quality and enrichment of polar terpenes compared to conventional extraction using solvents [134]. Methods for the production of de-odorized rosemary extract have been developed to meet the demand for a natural spice extract with strong antioxidant properties. S CO_2 has been used to remove all the undesirable flavouring components. The de-odorized CO_2 extracted rosemary is a safe for use as antioxidant in foods. (B) is effective at low use as antioxidant in foods, (b) is effective at low concentration (c) is oil soluble (d) is stable resen during processing (135). For use as an anti-oxidant, rosemary resin is usually fractionated from the essential oil, because of the oils eucalyptus-like note [7]. This is a commercial process for SC CO_2 extraction, but the extract has to compete commercially with the solvent extraction of antioxidant, as the major advantage of capturing top notes that SCO_2 has, is negated because of evaporation of the essential oil. A solvent extracted and fractionated anti-oxidant is as functional as a SCO_2 extract [7].

The analysis of rosemarry oil has been reviewed [136]. The analysis of flavour and fragrance compounds using SCFE coupled with gas chromatography have also been reported [66].

38. Sage

Methyl acetate was used as an entrainer with S CO_2 at 200 bar and 40°C to extract sage with a subsequent fractionation under liquid $C0_2$ conditions of 53 bar and 12°C to obtain 4.3% yield [102] as compared to only 1.1% by steam distillation [13]. There is an European patent for the extraction and fractionation of sage with CO_2. Russian workers also reported on S CO_2 extraction of sage [97]. Another report [35] on CO_2 extraction and subsequent TLC analysis of sage has been reported. The composition of sage has been reviewed [137].

The ethanolic extract of sage was separated into 5 frictions through re-extraction with SC CO_2. Further fractionation of the most active anti-oxidant fractions by means of liquid chromatography with silicic acid as absorb-

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ent, 5 antioxidants have been identified [96].

39. Savoury

There are two main varieties, know was 'Winter Savoury' & Summer savoury' Mild SC CO_2 conditions of 100 bar and 75°C, using hexanes as an entrainer were used [13] to extract savory. Subsequent fractionation at 50 bar and 35°C gave a disappointing yield of only 0.8% compared to 1.68% by steam distillation. Thus there is scope for further research for standardization of SC CO_2 extraction of savoury.

40. Star - Anise

The pioneering work on star anise caraway, clove and cinnamon was reported comparing SC CO_2 extraction with steam distillation of star-anise [36]. S CO_2 extraction of star anise has also been studied [13]. At a pressure of 300 bar and 40°C for extraction and a subsequent fractionation at 55 bar and 40°C for extraction an oil at a 12% yield and an 8.5% volatile oil content. Subsequent experiments with hexane as an entrainer with CO_2 did not improve the extraction. The analysis of star-anise oil has been reviewed [40].

41. Tarragon

A process for drying the extract of tarragon obtained by high pressure extraction with liquified gas/gases in the super critical stage has been developed [83]. The process involves treating the gas stream that is charged with extract with a solid drying agent in powder or granular form.

42. Thyme

A GC-MS of laboratory extracted L.CO_2 and steam distilled red thyme oil yielded 2.1% oil and 1-2% respectively (139). Of significant difference in composition of the 2 oils were (i) lower monoterpene hydrocarbons especially para-cymine and (ii) higher levels of free fatty acids C16-C18 in the CO_2 extract. Characteristics of 57 compounds were identified in the CO_2 extract oil are tabulated and discussed in comparison with those obtained by the usual steam distillation and of commercial oil[139]. Analysis of flavour and fragrance compounds naturally present in thyme oil, using super-critical fluid extraction [66]. Ten minute extraction normally yielded recoveries of extractable analytes and the total extraction and analysis time required was less than 40 minute per sample. Replicate analysis showed good quantitive reproducibilities [66]. Using mild super-critical conditions with hexane entrained at 150 bar and 40°C with subsequent sub-critical fractions at 50 bar and 9°C, a similar yield of 2% to that of steam distillation was obtained [13]. The chemistry of thyme oil has been reviewed [140].

43. Turmeric

Liquid CO_2 has been used to selectively extract turmeric rhizomes to obtain a yield of 3.4% in 2 hours at 60 bar and 20°C. The results have been compared it to a steam-distillation yield of 5.5% in an unspecified time [16a,56a]. Because of this and also keeping in view the possible incomplete extraction under mild conditions, further research at higher pressure and for a longer time is suggested (7). The chemistry/analayis of turmeric oil has been reviewed [141].

44. Vanilla

Vanilla extraction with S CO_2 has been patented (142) with two stages of processing. Extraction at 400 bar and 45°C and separation at 65 bar and 25° gave 10% yield. This was subsequently refuted by Calame and Steiner [130] who used Bourbon vanilla beans, with 1.5% vanillin extracted at 300 bar and 40°C with ethanol entrainer to give a 3.44% yield at 37% Vanillin. These results have been confirmed (7). Both liquid and super-critical CO_2 extraction of vanilla have been reported and discussed [27]. Besides, (i) minimal changes in

Table 2 Yields and Extraction Time for 11 Spices Extracted by Liquid Carbon Dioxide and Prepared by Steam Distillation

Spices	Liquid Carbon Dioxide		Steam Distrillation	
	Yield(% w/w)	Time (Hrs.)	Yield (%w/w)	Time (Hrs)
1. Cardamon	9.4	2.5	9.0	5
2. Chilli	4.9	2.5	-	-
3. Clove	20.0	2.0	15.0	6
4. Cumin	4.5	2.0	2.5	4
5. Cumin Black	4.5	2.0	1.0	-
6. Fennel	5.8	2.0	3.0	5
7. Ginger	3.7	2.5	1.6	6
8. Mace	18.5	2.5	13.1	-
9. Parsley	9.8	2.0	2.7	5
10. Poppy Seed	2.5	2.0	-	-
11. Turmeric	3.4	2.0	5.5	-

Source : Naik, Lentz & Maheshwari (1989)

or degradation of vanilla extract, (ii) properties of LCO_2 extracts and (iii) advantage of the LCO_2 extraction technique over other extraction techniques have been highlighted [27]. The analyses of vanilla extracts have been reviewed [143].

Future Scope and Further Research Needs:

There are 86 spices grown in the world and traded internationally worth US $1.5 billion. India grows over 50 spices and exports about 20 spices for earning foreign exchange to the tune of Rs.1860 crores (or Rs.1800 millions) in 1994-95. This includes export of spice oleoresins and spice essential oils worth Rs. 285 crores as compared to 1-2 crores in early 70's. (Table 1) This spurt in exports can be further increased if SCFE Technology is rigorously applied, to the extraction of spice essential oils and oleoresins since, till today, the oleoresins are extracted by using organic solvents, some of which are carcinogenic and their use is prohibited by some importing countries like USA, UK,Germany etc. There is therefore, ample scope for SCFE in the area of oleoresin since it will not only solve the serious problem, but will also further improve the quality of these very oleoresins, thereby fetching more premium in international markets. India is already the largest exporter of oleoresins.

India is one of the largest producers and exporters of spices in the world. there are 86 spice grown in different parts of the world, but so far only 44 spices have been researched upon. On some important spices the published information is rather scanty (hardly 1 or 2 references). There are several important spices which have not been touched upon so far in this area. Notable among them are: Asafoetida, Bay,Curry leaf, Indian Dill (Sowa), Horseradish, Kokam, Japanese, Mint, Yellow and White Mustard, Green Pepper, White Pepper, Saffron, Shallots, Spearmint and several other spices.

Some spices are known to have medicinal value which need greater attention. For example,Turmeric Garlic and Green Chillies are reported to be anti-cancer, while Fenugreek is found to heal diabetes. Garlic and Cloves are strong natural antibiotics while several other spices have antiseptic and preservative properties. They need greater attention of spice scientists all over the world.

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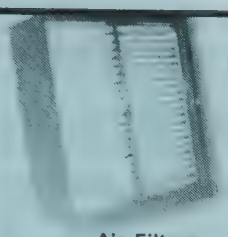
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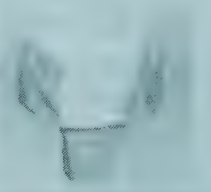
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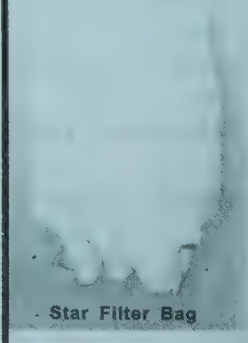
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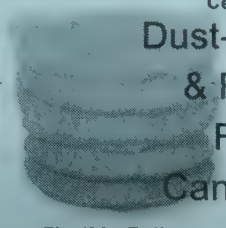
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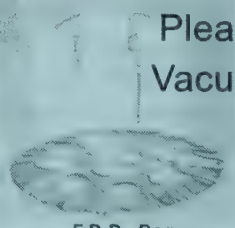
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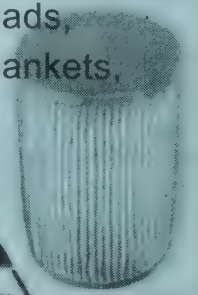
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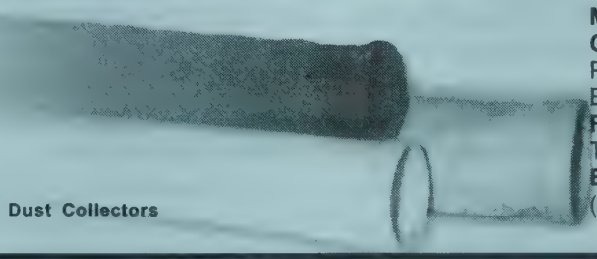
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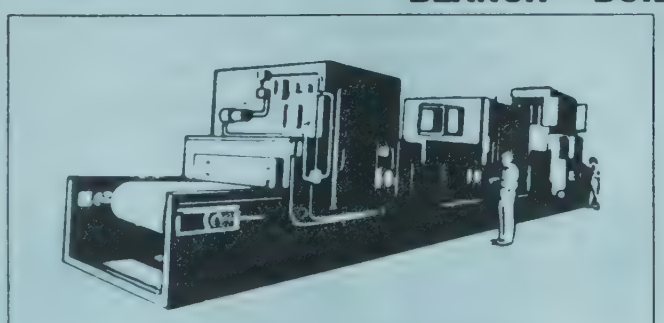

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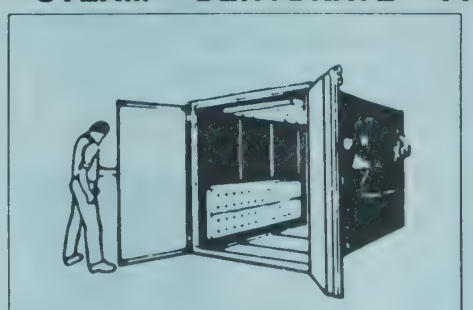

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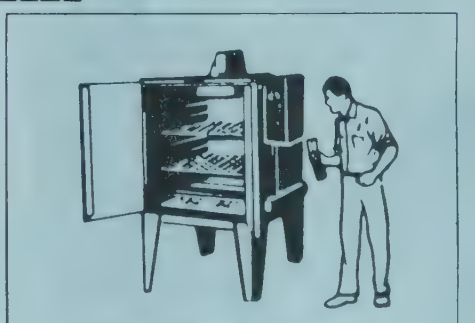

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Packaging Machinery for Food Articles

by

K. V. Viswanathan*

Food articles being manufactured require proper handling and packaging. Proper handling ensures that no contamination taken place. It also eliminates unwanted items like, chaff, stones and other foreign particles. On the other hand, packaging protects the products against contamination. It facilitates handling in small bulk. It enhances the shelf life of the products. It also gives a good advertisement value/ presentation when displayed.

Depending upon the product involved, varieties of packaging possibilities exist. In this article, we shall confine ourselves to pouch packaging by using flexible packing material.

Pouch packing can be done using form, fill and seal machine. Form, fill and seal machine can be broadly classified into two categories namely, vertical form, fill and seal machine and horizontal form, fill and seal machine. Vertical machines are the most conveniently ones used in India as they are very economically priced, easy to operate and occupy less floor space (Fig.1).

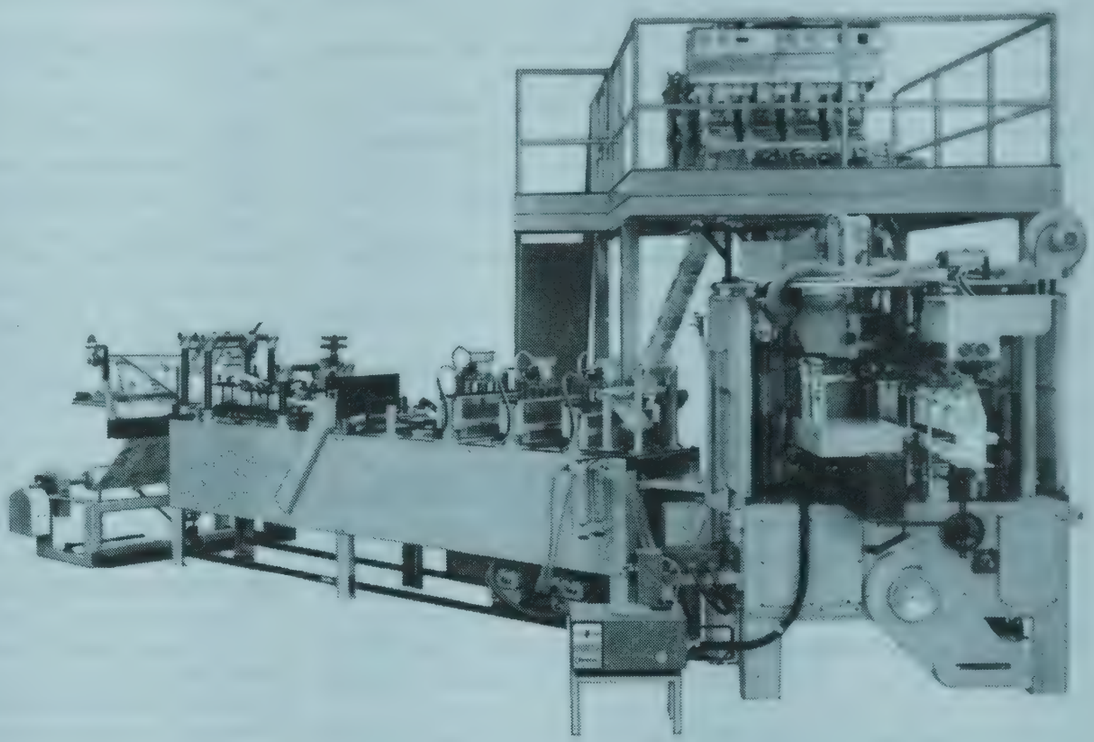


Fig.2 : Horizontal Form, Fill & Seal Unit

On the other hand, horizontal machines are costlier and little more complicated in working and occupy more floor spaces due to lengthwise construction of the machine (Fig.2).

However, the pouches produced on horizontal form, fill and seal machine give better strength of seal leading to higher shelf life. This is not achievable in vertical form, fill and seal machines due to limited time available for sealing.

It is possible to produce pouches which are pillow shaped or with squared bottom and gussetting of side. The top closing can be with squared top or gabled top. (Fig.3).

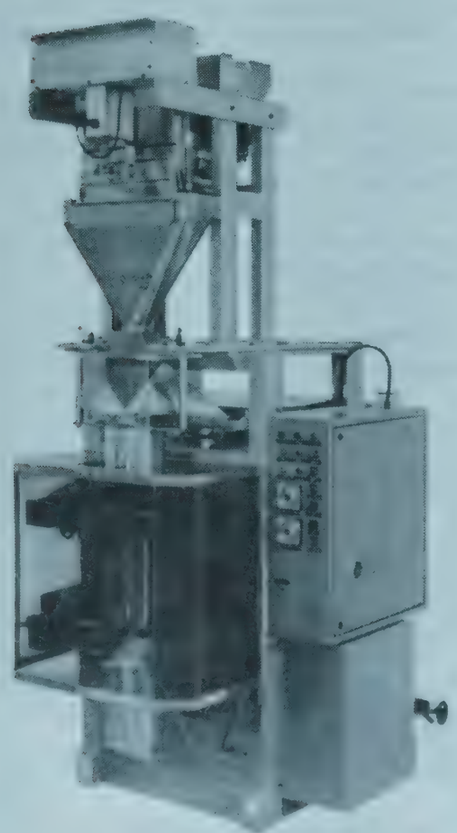


Fig.1: Vertical Form, Fill & Seal Unit

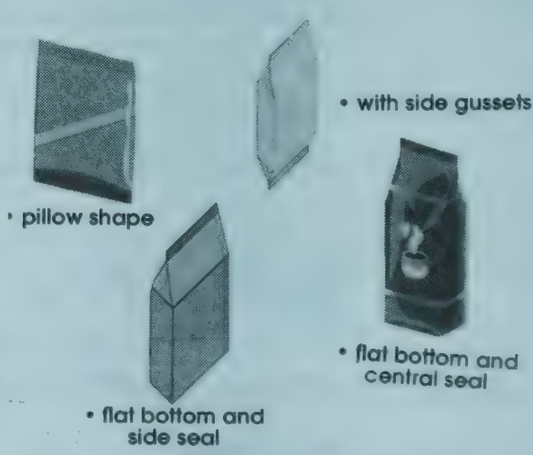
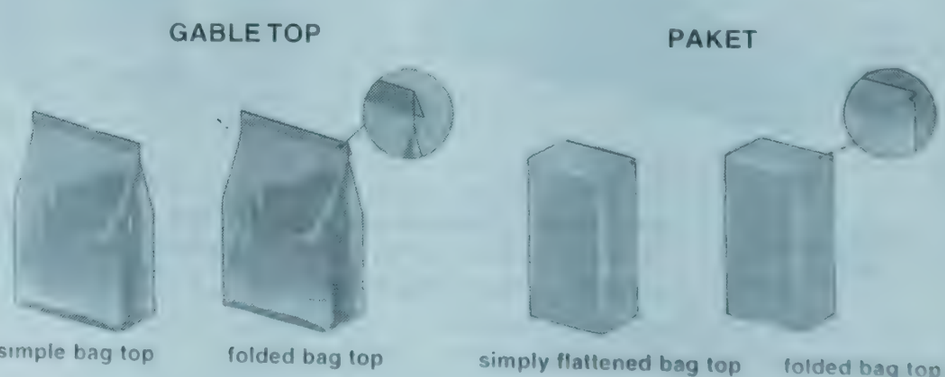


Fig.3 Various Pouches and Tops



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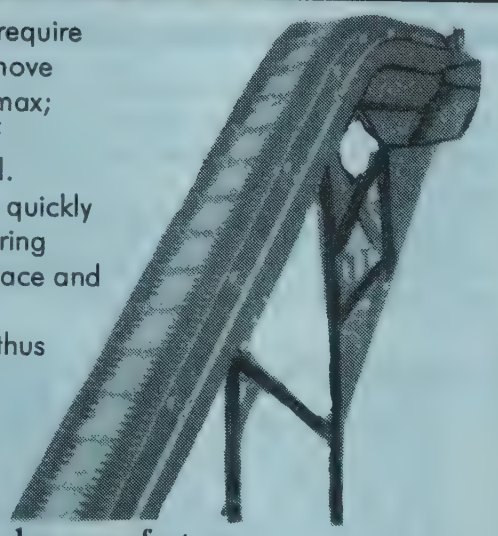

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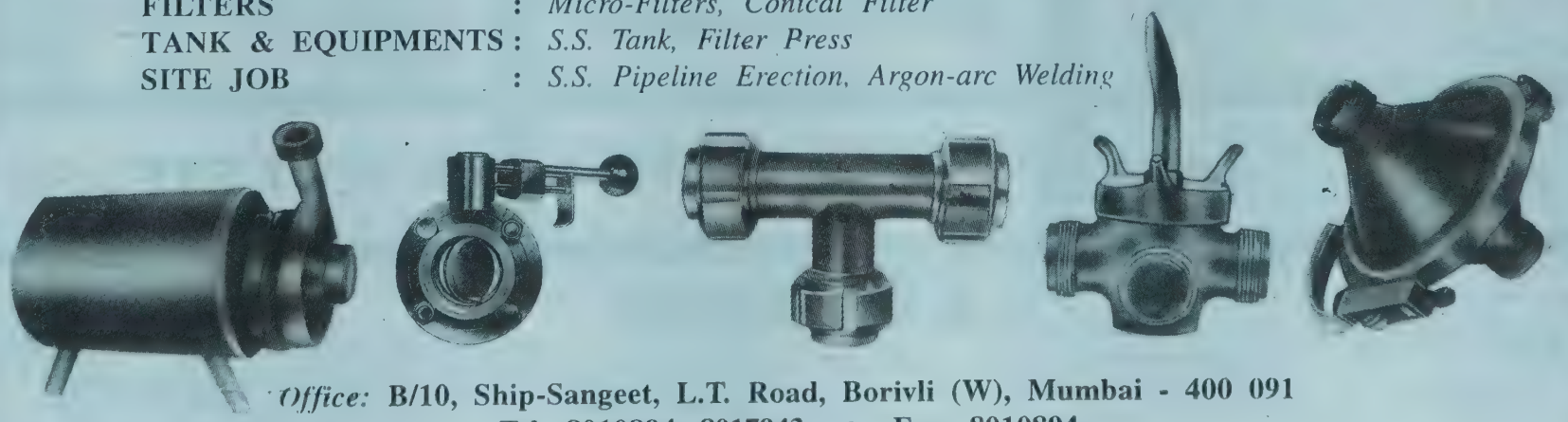

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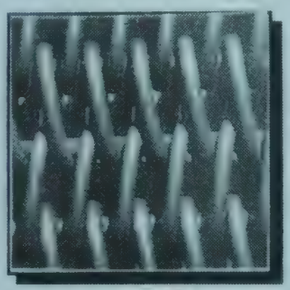
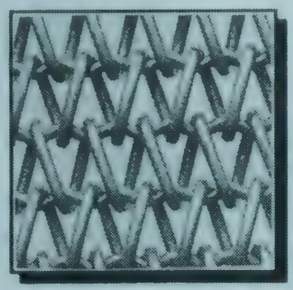


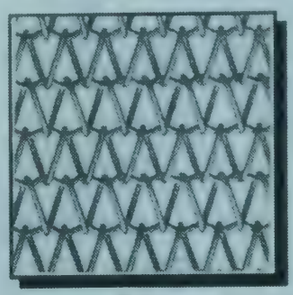
T-19

24 coils of 10 guage per foot width,19 crimped crossmembers of 10 guage per foot length.



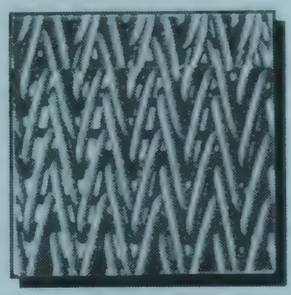
T-16

36 Coils of 12 guage per foot width. 22 crimped crossmembers of 12 guage per foot length.



T-5

60 coils of 16 guage per foot width, 40 crimped crossmembers of 16 guage per foot length.



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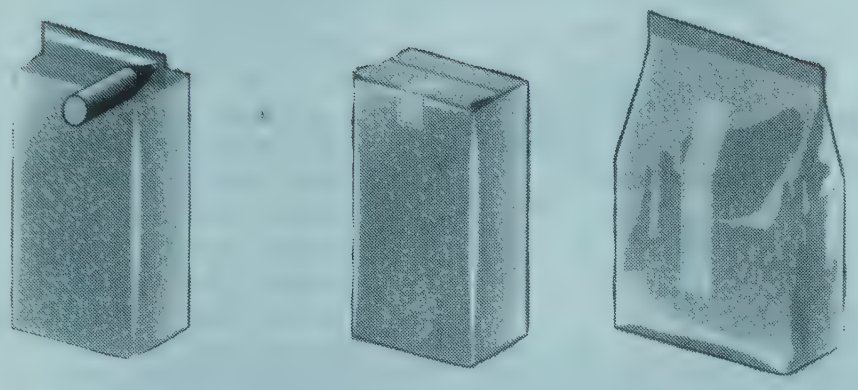
VITAL WHEAT GLUTEN

Fig. 4

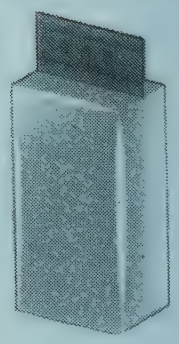
BAG TOP CLOSING



Point of hot-melt glue

Label/self-adhesive tape for closing and re-closing

SPECIAL BAG TOP TREATMENTS



IS99 device for making a "handle" (slot or holes) in the bag top, for easier and safer carrying

Device for making an easy-open tongue (with "peel-off" films)

Due to higher cost of machine to produce squared bottom and top such packaging techniques are not employed in common way in India. However, these packagings are the need of future. The pouches with squared top and bottom have well defined surfaces and can therefore be easily packed into shipping cases. They can stand on their own on the shelves in the shops. Hence, they can give better display of the products compared to pillow pouches which cannot stand on their own. It is possible to have various top closings for special requirements of customers. (See Fig. 4).

The pillow pouches generally have vertical sealing in the centre. (Fig. 5)

EASY-OPENING (peel-off)...

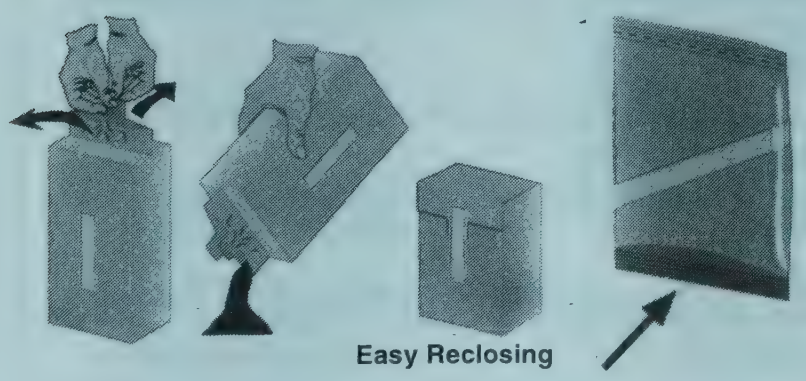


Fig. 5: Pillowpouch Seals

This limits the display value to only one side of the pouch. Operational sketch for vertical machine (See Fig.6) illustrates the sequence for producing pillow shaped bags and flat bottom bags.

In the case of pouches made of horizontal machines, both the sides of the pouches are generally available for printing and products like sugar, wheat flour, rice which are all consumed in a big way in India, can be well packed in squared pouches.

OPERATIONAL SKETCH

Fig. 6: Operational Sketch for Vertical Machine

Transparent packaging material can reveal inner contents. Wherever such a system is preferred, appropriate transparent film should be chosen for packaging.

Yet another possibility is the introduction of a scoop inside the bag (See Fig. 7)

IC99 device for introducing a scoop inside the bag

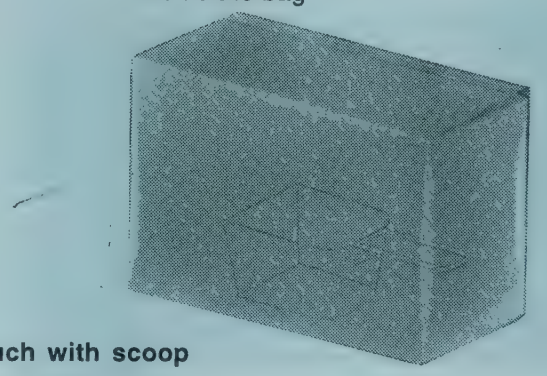
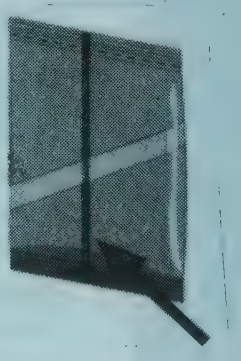


Fig. 7: Pouch with scoop

Another variation of this packaging system is to produce packs with gas flushing or vacuumizing. Gas flushing using inert gas like, nitrogen can enhance shelf life. It also causes the pouch to bulge, giving the cushion effect which is needed while transporting the pouches containing fragile material like, wafers, chips, extruded ready to eat products etc.



Vacuumising is carried out at the stage of filling and closing of the pouches. (See Fig. 8)

This gives a rise to very hard packs, looking like bricks. Such packs can be easily stacked into bigger shipping cases due to their firm shape. The advantages of vacuumizing is to remove the oxygen from inside the pack thereby preventing decay of product and increasing its shelf life. It can also retain aroma wherever involved. Products like, yeast containing the living organisms have to be packed under vacuum only. Products like nuts, tea, coffee powder etc., can be conveniently packed in vacuum packs to retain aroma and increasing shelf life.

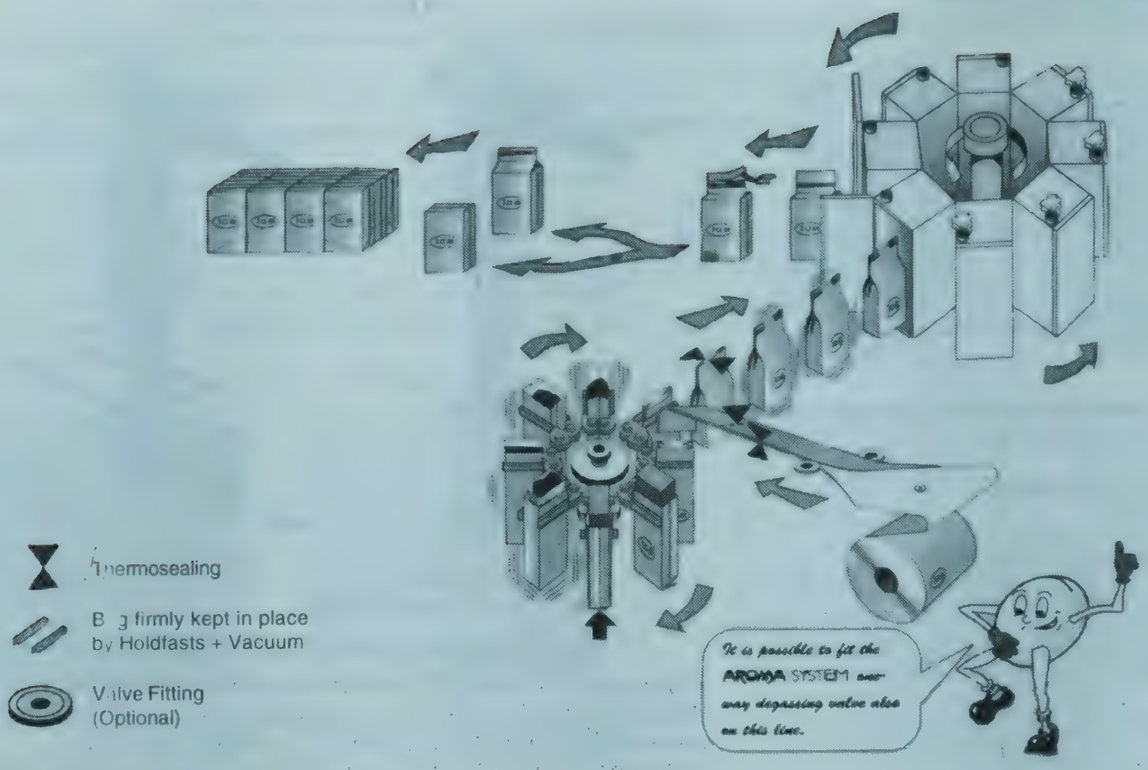

Thermosealing
Bag firmly kept in place by Holdfasts + Vacuum
Valve Fitting (Optional)
It is possible to fit the AROMA SYSTEM one-way degassing valve also on this line.

Fig. 8: Operational sketch for horizontal machine with vacuumising

A variation of this system is to provide one way valve in the pouch. This is useful for items such as roasted coffee beans which have a tendency to breathe. The excess pressure developed inside the pouch can be vented through the valves.

Thus, from what has been illustrated above, you will realise that there are many new possibilities of packing styles available, thanks to new developments in the field of packaging machineries.

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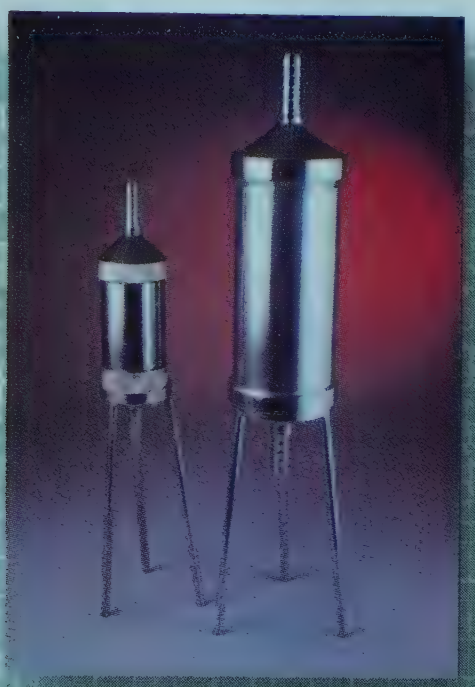

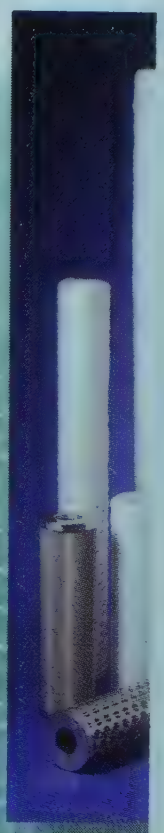

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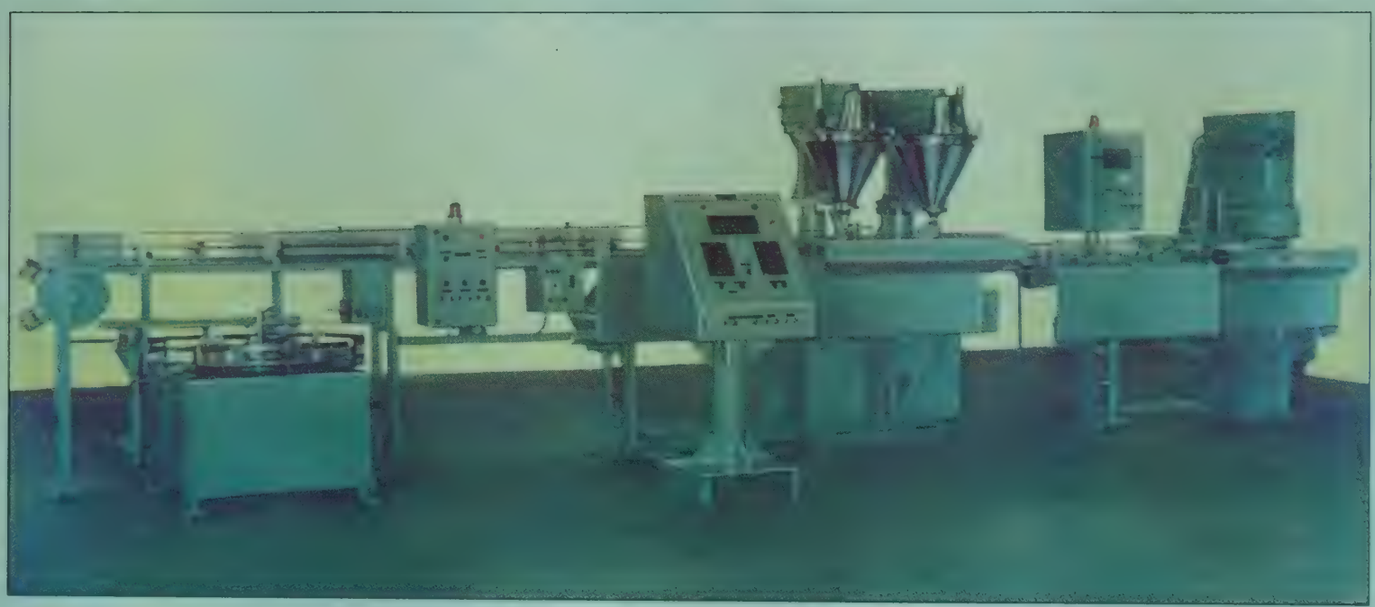

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NEWS & NOTES

AGRO-INDUSTRIAL FOOD PARKS

Twenty-five companies are invited by the Uttar Pradesh Government to set up operations in its upcoming agro-industrial food parks with a total outlay of Rs. 140 crore. The five food parks which would be set up in districts including Lucknow, Allahabad and Saharanpur would promote exports of agricultural goods from the state.

The state government has invited companies like Nestle, Monsanto to invest in the food parks and extended an invitation private developers for setting up the required infrastructure like cool chains," official sources said.

The government has identified Haldwani, Saharanpur, Lucknow, Allahabad and Chola as ideal locations for the upcoming food parks. The government hopes to get a grant of Rs. 12 crores from the Centre for the venture soon.

The areas have been identified as they have an abundant supply of raw material ranging from cereals to fruits and vegetables which are required to sustain any food park, sources said and added that these cities are also ideal because of their proximity to wholesale markets. "These areas would be able to provide cool chain facilities which are an essential requirement for handling perishable goods."

The proposed agro-industrial parks would offer common facilities for supporting and sustaining growth within the complex by providing customerised and industry specific infrastructure for the processing units thereby helping them in becoming competitive and self reliant.

ORTHODOX TEA PRODUCTION SHOOTS UP 63%

The tea industry, severely battered by dwindling realisations, has a spot of sunshine provided by the magic of orthodox tea. Production of orthodox teas upto Dec 2000 went up by a whopping 63 per cent.

What is interesting is that most top of the line tea companies have rescheduled their production to target higher volumes of orthodox teas, which find ready export markets.

Big guns like Tata Tea, Eveready, Warren, Assam Frontier, Goodricke Assam Company etc. have recorded higher production of the orthodox varieties. Williamson Magor may be one exception recording somewhat lower orthodox production, but then as a group the production is higher.

The India Tea Association (ITA) members as a whole, which represents 42 per cent of the north Indian tea industry, have together produced 6.4 million kgs more than during 1999. This is significant when compared to the production of CTC teas which has dropped by nearly a per cent, which in volume terms is 1.4 million kgs less in the corresponding period of the previous year.

Ever since the industry crossed the 750 million kg mark, the government was seen rooting for a production of 1,000 million kgs. First, this was thought of as the target for the year '00. Subsequently, '02 was given that responsibility.

The production of orthodox teas upto October last has touched the 95 million kg mark, up from 65 million kgs recorded in the corresponding period of the previous year.

In 1999, the industry closed the year with an orthodox tea production of 77 million kgs.

BLENDED EDIBLE VEGETABLE OILS — GUIDELINES

To protect consumers by ensuring that the blended edible vegetable oils are produced in a hygienic manner to certain specific requirements and are free from adulterants, the Bureau of Indian Standards has produced a standard IS 14309:1995, specifying the requirements of blended edible vegetables oils.

The standard defines blended edible vegetable oils as an admixture of two edible vegetable oils, refined or raw, or both, in which the proportion of any one oil is not less than 20 per cent. It prescribes certain requirements of the oil regarding moisture and volatile matter, acid value, unsaponifiable matter, flash point, etc. It specifies that the blended edible vegetable oil shall be clear and free from rancidity, adulterants, suspended and other foreign matter, separated water, added colouring or flavouring substances. However, it may contain permitted antioxidant in quantities permitted in *Prevention of Adulteration Act, 1954* and Rules made thereunder. This standard also specifies that the blended edible vegetable oil shall be

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free from argemone oil, hydrocyanic acid, mineral oil and other non-edible oils and adulterants, such as kusum oil, castor oil, neem oil, karanja oil, animal fat and trioresyl phosphate.

The packaging of the blended vegetable oils should mention among other things, the names of the vegetable oils and their types (raw or refined) used for producing the oil and also their percentages by mass. The standard specifies the method of tests for determining the specific requirements, ensuring the absence of adulterants and also determining the quality of the antioxidants present in the oil. The method of sampling the oil has also been specified. The standard also specifies compliance with 'Standard *of Weights and Measures (Packaged Commodities) Rules, 1977.'*

PACKAGING GHEE, VANASPATI, EDIBLE OILS & BAKERY SHORTENING — STANDARDS

To avoid contamination, maintain hygienic condition and to preserve foodstuffs, packaging is of prime importance. It is also easier to transport packaged foodstuff. Packaging of *vanaspati,* edible oils and similar commodities of mass consumption, is of considerable importance. Bureau of Indian Standards has published two separate standards for packing *ghee, vanaspati,* edible oils and bakery shortenings in tin containers, namely, IS 10325:2000 and IS 10339:2000.

IS 10325 is related to packing *vanaspati,* edible oils and bakery shortenings in 15kg/litre square tin containers while IS 10339 is for packing *vanaspati,* edible oils and bakery shortenings in square or round tin containers up to 10kg/litre capacities IS: 10339 includes sizes 10kg/litre; 5kg/litre; 1kg/litre; 2kg/litre; 500g/ml; 200g/ml round and square tin containers.

The requirement of material for body and ends for the tin containers according to IS 10325:2000 and IS10339:2000 is of standard grade single, cold-reduced electrolytic tinplate conforming to IS 1993:1993/ISO 1111-1:1983 or standard grade, double cold-reduced electrolytic tinplate conforming to IS 13954:1994/ISO 4977-2:1988. The requirement of tin coating thickness is of grade E2.8/2.8.

The rule also states than 'in case packing has been done on mass basis, declaration of volume within brackets, and if it is done on volume basis, declaration of mass within brackets, is to be done'. The latest version of the two Indian Standards, that is IS 10325:2000 and IS 10339:2000 has incorporated the provisions of the Standards of *Weights and Measures (Packed Commodities), Third Amendment Rules, 1994.)*

The other salient features of IS 10325-2000 and IS 10339-2000 are as follows: i) the requirement of material for a handle has been made mandatory as per IS 280:1978 'Mild steel wire for general engineering purposes'. ii) A test has been prescribed to determine the strength of the handle. iii) the requirement of percentage antimony in solder has been fixed at a maximum of 6 percent of the tin content of the solder. iv) Provision for keeping different heights to suit the specific gravity the sullage requirements of the product to be packed has been incorporated. v) Air pressure and hydraulic pressure tests have been prescribed for detecting leakages.

WINE EDUCATION

Moet Hennesy group has invited Hugh Johnson known for his masterpiece "Pocket Wine Book." to educate connoisseurs on the nuances of wine. About six million copies of the book have already been sold.

The International expert will teach the distinction between red, rose, white, brown, dry sweet, semi sweet and sparkling wines. The expert will also tell you what to drink when, how and why. Mr. Johnson will teach how to select a wine, how to determine the quality and also provide all the possible information about the vintage of wines.

Another professional the industry is waiting for is the undisputed Trans-Atlantic global wine guru, Robert M Parker Jr., author of 'Bordeaux' — a classic that launched him.

Mr Parker introduced to the world wine rating on a 50-100 point basis. He is the publisher of "Wine Advocate", a bi-monthly, considered a bible for the wine industry. It is also said that many wine manufacturers tune their wine to suit the palate of Mr. Parker.

India is virtually a virgin market, as wine is yet to capture the imagination of Indians who are still high spirited with their preferences for brown spirits and white spirits.

Wine consumed in India is minimal, three lakh cases a year against the global consumption of four billion cases. Compare this with the 70m cases of branded spirits, 200m cases country spirit and 70m cases beer sold every year in India.

The objective behind bringing the wine gurus to the country is to cultivate among people a taste for wine.

ARTIFICIAL SWEETENERS

Artificial sweeteners are being added in desserts but very few realise that its use is prohibited under the Prevention of Food Adulteration (PFA) Act. As per the law, any sale of items using artificial sweeteners, apart from that being used in carbonated drinks and other soft drinks is not allowed.

"Use of artificial sweeteners is not allowed in various food items by the government. However this fact is not known to many. The rules of the law are being flouted due to ignorance about the provisions of the Act.

While the use of artificial sweeteners, at the request of a guest is allowed by the law, it does not allow discretion of the hotels in the same respect.

The use of artificial sweeteners is preferred by several people particularly those suffering from diabetes," said Dr. S. Govindarajan, general manager (R&D), ITC Hotels Ltd.

The government is working towards amending the provision of PFA.

While the debate continues on whether to allow the use artificial sweeteners in bakery items, government officials continue to hold the belief that its usage may be harmful for health. Internationally such sweeteners are extensively used and there is no study to prove its harmful affects, said an undisclosed source.

It is expected that in the next meeting of the Central Committee on Food Safety (CCFS), which advises the government on provision of the PFA Act, the issue might surface again and a decision may be taken to that effect.

PACKAGING OF EDIBLE OIL

Every consumer has a right to life, and it is the duty of the government to ensure that the food products received by him are safe and not adulterated, as adulteration has direct impact on consumer health. Now at a time when India is harping on quality, efficiency and responsibility, the edible oil processors look the other way. The edible oil industry in India has never been consumer friendly. The edible oil processors are not willing to pack their products.

Although the Govt. passed an order 12 years ago "Edible Oil Packaging (Regulation) order, no state government has ever implemented it.

Packaging of a product immediately ensures three things: identification of the processor through labelling; a printed MRP; and more efficient tax collection from retailers. Despite the Prevention of Food Adulteration Act, it

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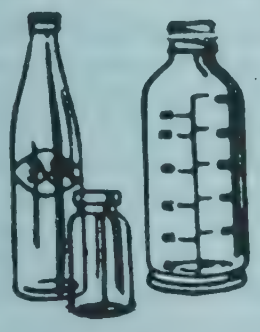

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has been impossible for public food safety officials to test and control the quality of edible oils. Nearly 90 per cent edible oils in India are sold loose.

So there is ample opportunity for the unscrupulous to adulterate it with inferior oils, if the risks are low enough. A tip-off to food inspectors serves little purpose as manufacturers don't print their names on any tin and the guilty thus live to adulterate another day. If packaging is made compulsory, this anonymity would be immediately lost and with it all the extra margins.

Currently, out of the total 98,000 tonnes sold each month, only 11,800 tonnes is packed. After the Order comes into force, 91,800 tonnes per month would be packed while 7,000 tonnes per month would be sold loose. The additional estimated sales tax alone will therefore be Rs. 7.7 crore per month or Rs. 92 crore per year.

The single biggest reason for the popularity of branded oils has been simply that they inspire greater confidence about quality and MRP among consumers.

Loose oil manufacturers point out that the machines needed to package oil are far too expensive and the price-sensitive consumer is reluctant to pay that extra cost.

But it is an argument hard to believe. If pan masala and even blended tea can be sold to consumers in pouches priced at Rs. 2, costs of machinery can hardly be a significant deterrent for edible oil. Actually pouch packing machines are available for as little as Rs. 2.5-5 lakh. A top-of-the-line Advanced Volumetric Oil Filling Machine capable of filling 10 pouches per minute or 2,50,000 one-litre pouches per month can be bought for only Rs. 4.5 lakh. Millers could also sell their bulk oil to other registered packers, who in turn will test and pack the oil as required under the Order. This system is also followed by certain large oil companies who supply oil in bulk to their contract packers who pack the oil into retail packs of various sizes and give it back to the large oil companies for marketing. Millers are also baulking at the thought of mandatory lab-testing under the Order. The Order permits arrangement of a common laboratory for testing samples, and certified public laboratories are also available for the purpose. So the actual reasons for this reluctance for product certification obviously lie elsewhere.

But the most stupefying argument of all offered by traders is that the Order deprives them of their fundamental right to carry on business in edible oil. If their dependence is on a fundamental right to cheat customers and do business without accountability, certainly this would be true. But if the industry's intention is genuinely to sell oil, packaging would only benefit.

LIQUOR MAJORS DEMAND UNIFORM EXCISE DUTY

The heads of various liquor brands have decided to get together and meet the top government officials in a bid to seek uniformity in the excise duty structure. Besides these, they are also expected to take up various other problems that plague their industry. Whyte & Mackay and Radico Khaitan MD, Amar Sinha said, "A uniform tax structure is essential for the liquor industry. Various issues in the alcohol and beverage industry are basically state related. Hence, we have requested a hearing with excise commissioners, finance secretaries and revenue secretaries of all state governments under one roof so that they can decide unanimously on excise duty and do away with the current faulty excise structure." Experts believe that the faulty tax structure is biting into the liquor industry and for this revenue generating industry to prosper, such a happening must be done away with.

DAIRY SECTOR

India is the largest buffalo milk producing country in the world, yet how much of this potential will India exploit. Global milk production has increased. Though production has stagnated in European Union, reduced in Eastern Europe, India is the only country that has maintained consistent and significant growth till today. Now India is in an advantageous position in buffalo milk production.

The world export trade in dairy products has gone up by 16 per cent in the post-WTO era, Indian industry has by and large concentrated on its vast domestic market, thus reducing itself to a minor player in the world market. Liberalisation under WTO was expected to lead to higher and more stable price but what has happened so far is just the reverse.

The global market today is perhaps more volatile than ever, as dairy products continue to be amongst the most heavily subsidized commodities in the world. As long as subsidies (domestic/export) are permitted to prevail, the stable world market will remain a distant dream and more importantly a major threat to the Indian dairy industry through dumping of highly subsidized milk powder and butter oil in the Indian market.

Other major threats include some highly discriminatory, biased provisions in some of the agreements under the WTO, like URA, AOA and SPS agreements.

Though Operation Flood helped the country attain the top position among milk producing countries, the domestic scenario has to be improved dramatically if India is to earn a place in the global market, the World Bank

consultant maintained. Though Operation Flood made India a 'doodh ka sagar' (ocean of milk) the cooperative and private sectors should assume a bigger role.

The total share of the organised sector, both cooperative and private sectors, is barely 12 per cent of the milk production, the rest of 88 per cent is being commanded by the unorganised sector or the 'doodhwallahs'. The growth in milk production is estimated to be about four per cent in the near future.

Demand for milk, in the domestic market, at current rate income growth is estimated to grow at seven per cent.

According to the World Bank, India is the fourth largest economy in the world going by the purchasing power parity estimates and has been identified among the first ten emerging markets in the world. India has a vast domestic market with over one billion customers - a majority of whom are vegetarians and for whom milk is an important part of their diet. The scope for dairy ventures in the country is great.

The globalisation of the dairy industry due to continuing trade liberalisation has generated a new set of standards and expectations. The most important of which is that Indian dairy industry would be able to survive the global onslaught only if it is internationally competitive in terms of * Price * Safety and quality of products * Technological compatibility and * Marketing strategy.

SOUTHERN STATES CULTIVATING LEMON GRASS

Lemon grass which has a large number of applications in India and abroad, is getting popular with farmer in the Southern states. It is used in perfumes, ginger and coconut cultivation. A process to distill lemongrass has been found by the Aromatic and Medicinal Plants Research Station.

SOYAMEAL IN DEMAND

European Union recently banned the import of meat based animal feed due to the mad cow disease. This ban is a blessing for the Indian Soyameal exports as this is the only commodity that would replace the animal feed, a top official of the Soyabean Processors Association of India (SOPA) said.

Out of the total production of 3.7 million tonne last year, India had exported about 2.4 million tonne to various European countries. D.R. Kalra, secretary general of the association said that SOPA was also contemplating on sending a delegation to the countries including Germany, Italy, Belgium and France to explore business opportunities.

$2,68,000 UN AID FOR STANDARDISATION OF FOOD PRODUCTS

The UN Food and Agriculture Organisation (FAO) will provide assistance worth $2,68,000 to India for strengthening the National Codex Committee (NCC) to facilitate standardisation of food products conforming to international norms.

An agreement to this effect was signed here, by FAO representative Peter Rosenegger and agriculture secretary Bhaskar Barua. The project will be executed by the health ministry.

The two-year project aims at revamping the NCC as well as the National Codex Contact Point (NCCP) to ensure effective conformity to the globally accepted Codex quality norms for the food products. The Codex standards have become critical in international trade of food products under the sanitary and phyto-sanitary measures listed in the new world trade order.

The Codex committee would provide advice to the government on implications and food safety issues arising from the guidelines laid down by the Codex Alimentarious Commission, the global apex body for this purpose.

SOFT DRINK INDUSTRY

Soft Drink Industry is reeling under the impact of special excise duty. Industry chambers in its prebudget memorandum has demanded that the special excise duty be reduced from the present 24 percent to 16 percent and it should be further lowered to 8 percent in due course of time.

Assocham has recommended removal of SED on soft drinks in line with other processed food items and beverages. It has added that if the government is not in a position to remove SED on soft drinks immediately, the industry may be granted relief in a phased manner and it should be brought down to 8 per cent as a first step.

Treating a mass consumption product like soft drinks at par with products which were notified by the government as injurious to health and thus, levying highest rate of SED on the product, is unfair, Assocham has said.

The industry chambers feel that as the soft drinks industry facilitates both backward and forward linkages by creating demands for other sectors, it should get its due from the government.

POLICIES TO LURE FDI IN FOOD PROCESSING

All India Food Processing Association recently held a national seminar on "Food Processing and National Objectives – challenges in the new trade order" Mr Omesh Saigal – secretary to the department of food processing industries said the country needs to create a conducive environment in terms of sound taxation policies to attract foreign investment in food processing to the tune of Rs 15,000 crore every year. Currently only two per cent of fruits and vegetables in the country are processed. To bring this level to even 10 per cent, India requires an investment of Rs 1,50,000 crore. This would mean an annual investment of around Rs 15,000 crore which can only come from foreign investors.

The existing high taxation rates including sales taxes and octroi and the multiplicity of laws and implementing agencies are the two main factors responsible for the present state of the processed food sector.

He said, for development of this sector, there should be a taxation structure "which is in line with international practices."

Saigal further added that the ministry was proposing to enact a Processed Food Development Act, and "the nature of the Act will be developmental rather than regulatory. The proposed Act envisages defining standards for uniform and universal application, merit goods for incentives, creation of development fund dedicated to the food processing industries and creation of equalisation fund as cushion for price fluctuations."

The Act also incorporates futures trading and new technologies in packaging, processing and fortification, the secretary added.

INDIA LEADS THE WORLD IN MENTHOL MINT OIL PRODUCTION

India has become a world leader in the production and supply of menthol mint-oil — a source material used by the pharma, food and perfume industry. This achievement is the breakthrough agro-technology developed by the Central Institute of Medicinal and Aromatic Plants (CIMAP) in Lucknow.

India also holds a national and international patent on the basic variety of the new cultivar of Mentha arvensis, a

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plant used to extract the highly popular oil. Patents for the other two varieties are awaited.

According to Murli Manohar Joshi, minister, science and technology, the new variety permits three harvests per year and has given fillip to India's production. So much so that, out of the international demand of around 20,000 tonnes India now meets 70 per cent — i.e. 14,000 tonnes.

Earlier China, which was the leading exporter, fed 60 per cent of the demand through, its variety Shivalik. But now India has not only edged it out, but even exports the oil to China. It also exports the oil to Brazil another major producer and exporter. During the past year, revenues from the export of the oil touched Rs. 3 crore.

Mr. Bhojwani, science secretary, Council of Scientific and Industrial Research (CSIR), under which the CIMAP laboratory operates, said that new mentha varieties — christened Himalaya and Kosi — are early maturing, disease and pest resistant, give higher yields of oil, and have higher content of menthol. "The main constituent l-menthol is widely used for purposes ranging from the common to the exotic. It is used in lozenges, toothpaste, balms, food flavouring agents and hair oils," he points out.

The cultivation of the new varieties is taking the shape of commercial agriculture, and India is now able to produce 15,000 tonnes of the oil from an area of 1,25,000 hectares. About 35 per cent of the mint cultivators plant the mint crop after the harvest of traditional and winter season crops of mustard, potato, lentil and wheat.

MUSTARD/RAPESEED OIL FORTIFIED WITH VITAMIN A

Fifty-eight per cent of children under the age of three are malnourished in India. One of the major diseases of malnutrition is blindness in children, caused by the deficiency of vitamin A.

Vitamin A deficiency can lead to night blindness, permanent blindness and severe diarrhoea and even infant mortality. Carotenoids (pro-vitamin A) are present in number of vegetables and fruits such as carrots, tomatoes, oranges, spinach, and mangoes. Fortification of food is one way of increasing the Vitamin A content. Fortification of vanaspati, milk, flour is already being undertaken. Micronutrient Initiative is also planning fortification of sugar and rice with Vitamin A.

The Tata Energy Research Institute (TERI) has launched a project with support from the US Agency for International Development (USAID) to enhance beta-carotene (Vitamin A) content in mustard oil, an extensively used cooking medium. TERI researchers feel that if the Vitamin A content in the oil can be increased significantly, even a teaspoon of this oil in the diet could provide the recommended daily intake of beta-carotene for an adult. Large doses of Vitamin A can be toxic but when ingested in the form of beta-carotene (pro-Vitamin A), it is not toxic. Studies show that one-fourth of total beta-carotene consumed is converted to Vitamin A in the human body.

Another private company, Monsanto has developed the technology to enhance the levels of beta-carotene in rapeseed oil (canola). The company has been able to insert a phytoene synthase gene into the seed to generate the extra amounts of Vitamin A in only the seed. These seeds, when crushed to produce the oil, have levels of beta-carotene that are greater than currently available in any other oil or vegetable.

IMPORT TARIFF ON WHISKEY

The Indian government in a move to protect the domestic liquor industry has laid 222 per cent tariff duty on imported scotch whisky. The Scotch Whisky Association, a trade body of Scotch whisky manufacturers has urged the Indian government to reduce it to 70 per cent.

According to SWA, scotch whisky will continue to be dearer even after the government removes quantitative restrictions on April 1, '01. Even at the tariff rate of 70 per cent, the cheapest scotch whisky will cost over Rs. 600, according to an estimate by Tim Jackson, director, commercial affairs, SWA. According to him scotch whisky will not threaten domestic spirit companies as it has less than 2 per cent of the nearly 70m cases being sold in the Indian spirit market. The SWA has presented their case for a lower tariff rate to the government.

Illegal trade will go down significantly if duties are rationalised Counterfeit BIO (bottled in origin) brands alone account for 3,90,000 cases a year. Sale of smuggled and counterfeit spirit results in a loss of revenue to the government, sources say. Only 45 per cent of the 9,08,000 cases consumed in India is through legal sale. The smuggled, carry back (bottles carried by people who come to India) and bonded warehouse (duty free sales to ships and diplomats etc) sale of whisky accounts for 4,18,000 cases every year.

SWA feels reduction of tariff rate will eliminate incentive for contraband sales. They have estimated that a reduction in tariff will result in a four fold increase in customs and local revenue from Rs 128 crore to Rs. 515 crore. Such a measure is a positive message to the country's trading partners. SWA sources said. The government has not given an official answer to SWA on whether the government will abide by an agreement it had signed in '97 with the EU to remove quantitative restriction on scotch whisky and cognac in the year '00.

VANASPATI, EDIBLE OIL INDUSTRY

The industry chambers have asked the government to take corrective measures for solving the problem of cheap imports of vanaspati and edible oil from Nepal.

Assocham in its pre-budget memorandum has pointed out that vanaspati from Nepal sells Rs. 60 to Rs. 70 cheaper per 15 litre tin than Indian vanaspati resulting in unfair competition. The government should take remedial measures to tackle the issue of cheap imports from Nepal.

Vanaspati and refined oils should be deleted from the list of goods covered under Indo-Nepal Trade Treaty or appropriate import duty should be imposed to provide a level playing field to the domestic industry, Ficci has said in its memorandum.

Duty-free imports of vanaspati and edible oils were allowed under the Indo-Nepal Trade Treaty subject to the condition that articles manufactured in Nepal would contain not less than 50 per cent of Nepalese content.

The value-addition condition, however, was removed at the request of the Nepalese government in December 1996.

A vanaspati factory in India is required to pay between 16.5 per cent to 38.5 per cent for import of specified vegetable oils, whereas its counterpart in Nepal gets the same at zero customs duty and thereby gains substantial cost and competitive advantage, Assocham said. This has turned a number Indian vanaspati factories unviable, it added.

ICE CREAM INDUSTRY

The icecream industry has been badly hit by increase in excise duty. From a specific levy of Rs. 2 per litre in February 1994, the excise duty has been increased to 16 per cent ad valorem (equivalent to Rs. 12 per litre)

in a span of five years.

Industry chambers have demanded reduction in excise duty on ice-cream. They have also suggested to the government to raise abatement available to this industry from 45 per cent to 50 per cent. It needs to be appreciated that the industry is unable to pass on the increase in excise duty to consumer due to price elasticity in demand, said Ficci. It has added that the growth in ice-cream industry needs to be encouraged because it is a part of the dairy industry which is the backbone of the rural industry.

The chamber has also said that higher abatement was required for this industry due to refrigerated distribution, which involves higher margin to retailers, wholesale distributors and higher cost of cargo movement.

DAIRY WHITENER

Dairy whiteners are being increasingly used in Restaurants, catering units of the railways, airways and even in the households due to ease in storing and preservation as compared to liquid milk. The widespread use of this product necessitates developing some norms of quality in order to product the consumers. With this in view the Bureau of Indian Standard had published the standard IS 12299:1998 'Dairy Whitener — Specification'.

IS 12299 specifies the requirements and methods of sampling and testing of dairy whitener. It defines dairy whitener as sweetened partly skimmed milk powder prepared by spray drying of cow milk, buffalo milk or a mixture thereof. The milk may be modified by partial removal/substitution of milk solids (non-fat) with carbohydrates such as sucrose dextrose or dextrine. It specifies that only certain specific chemicals can be used as additives to the extent prescribed.

The standard prescribes that the dairy whitener shall be manufactured and packed under hygienic conditions as per IS 2491. As for microbiological requirements, the colony count per gram shall not be more than 40,000 when determined according to IS 5402. Harmful bacteria like Coliform, E-coil, Staphylococcus and Salmonella should be absent when tested as per the relevant standards.

The standard specifies the requirements and the methods of tests for the contents of milk solids, milk fat, acid insoluble ash, total added sugar, etc. It requires that the dairy whitener shall be packed in nitrogen or in a mixture of nitrogen and carbon dioxide in clean and sound metal containers or in food grade flexible packaging. The packaging shall bear some important information listed in the standard.

The dairy whitener may also be marked with the Standard Mark as per the provision of the Bureau of Indian Standards Act.

JAGGERY HAS MEDICINAL POTENTIAL

Consumption of jaggery, an eco-friendly sweetener is bound to increase in the coming days due to its tremendous nutritional and medicinal potential.

Medicinal importance of jaggery is tremendous," said Jaswant Singh of the Indian Institution of Sugarcane Research, Lucknow, adding it has cooling, diuretic and refreshing properties besides improving throat conditions. normalising semen and sperms and serving as a lactogenic and cardiac tonic.

Jaggery was prescribed in various disease like anaemia, jaundice, breathlessness and kidney problems, he said

Addressing the session on "Engineering sciences" at the Science Congress in Delhi, Mr. Singh said the common Indian diet was deficient in nutrition and jaggery with considerable nutritional value can be an important supplement, particularly for the people in the rural areas.

At the present population growth rates of about 1.6 per cent per annum. by '20 the sweetener consumption may increase to about 40 from the current level of 25 kg per head per annum, he said.

He said 35 per cent of the countries's required 54m tonnes of sweetener would be met by jaggery alone He said in case of jaggery, the recovery is supplemented by recovery of "reducing sugars", and minerals which make it more nutritious and health friendly. The process is safe and eco-friendly as it neither discharges affluents nor requires boiler houses thereby eliminating problems of accidents and pollution.

TAX HOLIDAY FOR FOOD PROCESSING SECTOR

The centre is considering the prospect of giving a ten-year tax holiday to the food processing sector. If agreed upon, the move is expected to give a major boost to investment in this sector. With excise duty shooting up to 16 per cent, the decision for a tax holiday will be more than welcome.

Simultaneously, the government is also working on a 'Processed Food

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Development Act' which is expected to provide a single window system and be instrumental in promotional and development activities. The processed food sector, according to officials, is in need of investments to the extent of Rs. 1,40,000 crore and shall generate employment for 77 lakh people per year.

OZONE: LATEST TOOL FOR FOOD SAFETY

According to the Agriculture and Food Technology Alliance (AFTA), the United States, ozone has the potential to become the next major tool for safe treatment, storage and processing of nearly all types of food — meat, poultry, fruits and vegetables. Although ozone has been used in other countries in food processing, the USFDA is yet to recognize it as an approved food additive. Ozone works as an oxidant to damage the cell walls of harmful micro-organism, thus killing them and leaving only oxygen. Moreover, because of ozone's short shelf-life, no residual matter is left in the food item. Ozone has the potential to replace agricultural pesticides that are being phased out of use, enabling safe storage of crops without the need for fumigation. It could also provide odour control in the fish industry.

MORINGA POD POWDER

The Central Food Technological Research Institute (CFTRI), Mysore, India, has developed a process to produce Moringa pod ('drumstick') powder that can be used like any instant masala powder. The process involves cleaning and preparing the tender pods of *Moringa oleifera Lam.*, drying, powdering and packing. The pods are rich in calcium and iron. This seasonal vegetable is used to prepare several curries. Glutamic acid in the pods imparts the characteristic flavour associated with this vegetable.

CINNAMON EXTRACT SPICES UP SUGAR METABOLISM

Cinnamon is a common ingredient in many dishes of the East. It has been known that a few spices, like cinnamon, make fat cells much more responsive to insulin. Cinnamon contains substances that, in test tube studies, wake up body cells to the hormone insulin. Researchers in the United States have now identified these compounds. None of the other 50 plant extracts evaluated by the team have come close to MHCP's level of activity. MHCP and other active compounds are water soluble and hence are not found in the spice oils sold as food additives.

CHOCOLATE: A NUTRACEUTICAL PRODUCT IN THE NEAR FUTURE

Recent studies in the United States have given chocolate near-nutraceutical status in its own right. Apart from its acknowledged property of having a neutral effect on blood cholesterol levels, research has indicated a possible antioxidant benefit similar to that associated with red wine — owing to the presence of relatively high levels of polyphenols.

Additional research also seems to indicate that chocolate affects the brain's neurotransmitters; specifically serotonin and endorphins, to improve mood and outlook. Based on these findings, Meiji, a Japanese company, has introduced a polyphenol-fortified chocolate for adult males. The new 'Chocolate Kok' contains more than double the amount of polyphenols available in regular chocolate - equal to 20 glasses of red wine. Hershey Foods, the United States, is another company planning to bring out nutraceutical products based on chocolate.

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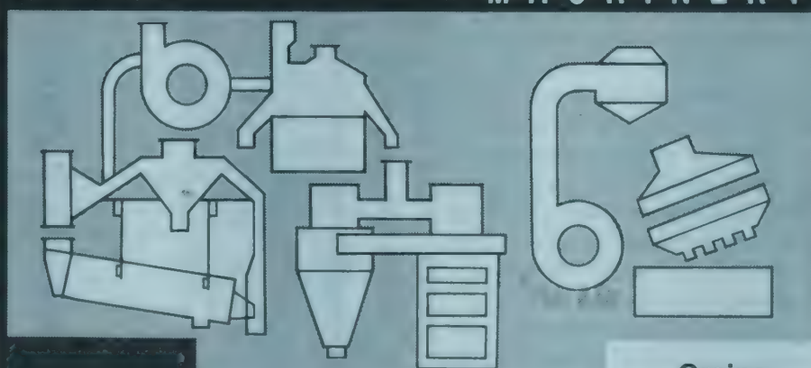

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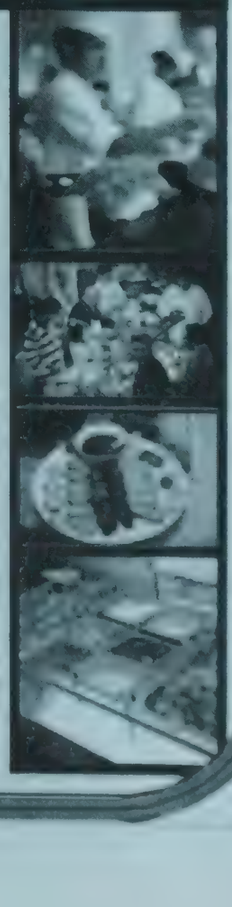

COMPANY NEWS

E&J GALLO/UB GROUP

Yet another international wine company is set to enter India. Officials of California based E & J Gallo were in Mumbai for talks with the Indian spirit major United Breweries for a tieup.

Sotherby's World Wine Encyclopedia describes E&J Gallo as California's largest winery — Gallo has a production equivalent to four times the annual output of the entire champagne region of France and is the largest wine producer in the world.

E&J Gallo has in its stables international brands like Chablis Blanc, Hearty Burgundy, Johannesburg Riesling, Sauvignon Blanc. Its product segments range from popular wine to premium to super premium ones.

The tie up with UB group is possible once the quantitative restrictions are removed on import's of Wine. Wine is expected to be put in the open general licence (OGL) category in the next export-import policy.

While the Indian spirit industry boasts of a sale of 70m cases of hard liquor and another 72m cases of beer ever year, the sale of wine is estimated to be less than 1.5m cases. This is a poor comparison with global wine consumption levels which is estimated at 4bn cases a year.

DS FOODS LTD.

"*Catch*" the brand name of natural spring water was launched by DS Foods Ltd. the food and beverage division of Rs. 600 crore DS group. Now it also plans to launch flavoured variants of spring water like rose and peach and diversifying its product portfolio to include aerated beverages, like ice teas and gas waters, said Ashok Aggarwal, Vice President, DS Group. "These value-added products will further grow the premium end of the bottled water market" he added. The premium bottled water market is Rs. 100 crore and is the fastest growing segment in the total bottled water market which is close to Rs. 400 crore".

Catch will soon be associated with a major cricket tournament as a part of the brand promotion exercise, he said.

In the domestic market, *Catch* has taken the institutional sales route to begin with and claims to have built up a healthy client base among corporates, premium hotel chains and supermarkets in the country. Aggarwal said that hotel chains like Hyatt, Taj Meridian, Mariott have already started buying from DS Foods and now big retail chains in Mumbai and Delhi are also its customers.

The brand also claims to be doing well in exports, in markets like the US, UK and the Middle-East where it is being marketed by a DS Group company, Baba Global Limited. The company claims to have exported spring water worth Rs.5 crore during the last eight months.

The *Catch* natural spring water is bottled at source at the Himachal Pradesh plant set up at a cost of Rs. 12 crore. The plant has a production capacity of around 30 million bottles per annum. Aggarwal says that the production capacity can be increased whenever it plans to launch flavoured water, beverages.

CHATEAU INDAGE

With a desire to introduce wine culture in India, Chateau Indage is introducing a white wine called *Rhine Pride*. This is possible due to joint venture between Chateau Indage and the German partners Peter Mertes, Bernakstel from Mosel Valley, Germany.

Chief operating officer of Chateau Indage, Ranjit Chogule reported that the company has already exported four containers of 21,000 litres each of its Angoori brand. It is a two-way joint venture. "On-one hand, the bulk bottling of the Indian wine produced by Indage will be sold under the brand name Angoori in Ger-

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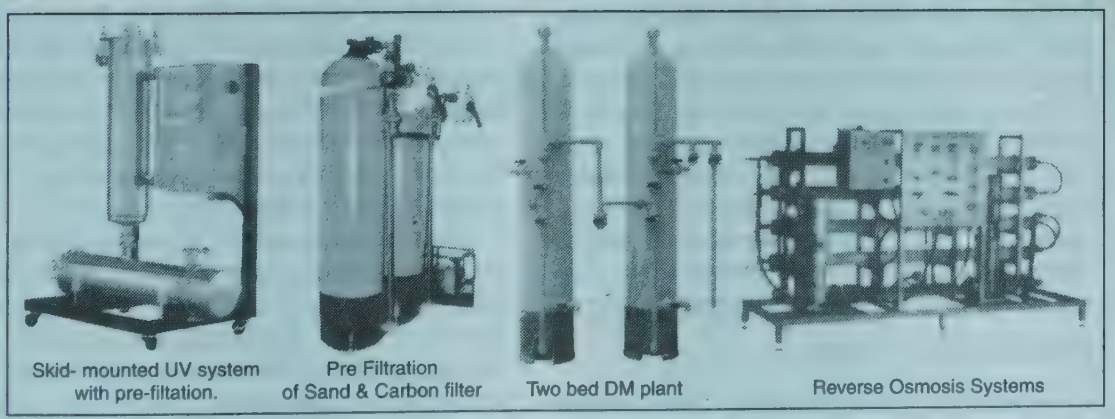

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many and, on the other, Rhine Pride will be bottled and sold by Chateau in India.

Priced at Rs. 470 for a 750 ml wine, *Rhine Pride* targets all consumer segments. Says Chogule: "It has been seen that wine is filtering down to many different socio-economic segments. People seem to have a liking for fruity, sweet wine though we have not been able to increase volumes according to the market trends.

According to Chogule, while the top and low-end market segment is growing at 30 per cent, the middle segment is growing faster at 40 per cent per annum. About 40,000 bottles of Rhine Pride are expected to sell in one year, he adds.

Chateau Indage tied up with the Australian company Cranswil and earlier to that it had entered into an alliance with Wente Vineyards of California and Groupe Thaillan of France. The 50:50 joint venture will see the partners and Indage using each other's strength in the field of viticulture and providing technical support in wine making to synergise mutual operations.

The joint ventures will develop new vineyards with the latest technology for commercial cultivation of grapes in the country. Says Arun B. Shah, managing director, Chateau Indage: "It is a sad commentary on the Indian viticulture that little less than one per cent of grapes have an industrial use. The other countries in contrast consume 90 per cent of grapes for the purpose of wine and wine-based products."

FOSTER'S INDIA

Australian brewery giant's Indian division Foster's India has decided to go national. The company is now chalking out a mega-expansion plan of having breweries across India.

Pradeep Gidwani, managing director of Foster's India states, "We will build up a national presence in India and will grow through the acquisitions route. We will be introducing Foster's other international brands. *Crown Lager, Foster's Ice, Subzero, Carlton Cold* and *Victoria Bitter"*.

Foster's currently has a brewery in Aurangabad which caters to the Maharashtra, Goa, Daman and Diu markets. To support its growth plans, the company is looking at acquiring breweries in southern and northern India, and has already begun negotiations with a few breweries. Due to stiff state excise policies, the company will have to set up a countrywide chain of breweries to control costs and improve profitability.

Industry sources said that Foster's is eyeing the 1.5 lakh hectolitre capacity of G.M.R. Vasavi brewery in Andhra Pradesh, the fastest growing beer market in India. The brewery currently has manufacturing contract with Shaw Wallace.

Foster's Aurangabad unit has a capacity of 1.5 lakh hectolitre capacity. It has invested around Rs. 55 crore in this brewery. The multinational is expected to break even in the next five years time.

The company has grown by 20 per cent this year. During the last three to four months it has been selling close to 50,000 bottles a day and is currently having one-third market share in Maharashtra.

Its pint sales alone has seen a growth of 50 per cent. Foster's used to spend 20 per cent of its total sales revenues on traditional advertisement and the rest on ground level promotional activities.

MARS INC./EFFEM INDIA

US based confectionery, pet food & food majors Mars Inc. is planning to set up a manufacturing unit in India.

Mars Inc. has already set up a wholly-owned subsidiary, Effem India Ltd. to distribute its chocolate brands – Mars, Milkway, Snickers, etc. – in the domestic market. In order to reduce costs, since imported chocolates cost three times more than locally made ones, Effem is also in the process of establishing a cold chain as the chocolates melt at 20^0 Celsius, making them difficult to preserve in Indian conditions.

Mars has also joined hands with Pepsico for a joint research initiative relating to peanuts in India. At a later stage, Indian peanuts and cocoa may be used for making chocolate. Effem India, chief executive, Ellis D'Rozario stated that a commercial team was also researching crop technology with Indian farmers and cooperatives for developing better varieties of granulated garlic, tomato and onion for its sauces and peanuts etc.

Mars intends to launch biscuits and food products such as sauces, seasoning and snacks too in the near future.

The products should be on the market shelves by the middle of next year. "In case we set up a manufacturing facility for chocolates, we will have to make an investment of a minimum $25-30 million.

FRITOLAYS INDIA

Fritolay's India the Rs. 15 crore subsidiary of Pepsico is expanding the potato chips market through product innovations. After launching the Videshi Style Cream & Onion flavour potato chips, it now launches the desi non-vegetarian flavoured potato chips — the Tandoori style chicken followed by Malai Murg Tikka.

Priced at Rs. 15 for a pack of 50 grams, the variants will target non-vegetarian population. It is estimated that almost 50 per cent of the Indian population is non-vegetarian. The only player in the non-vegetarian segment was Pringle with its imported chips. So far, Frito Lays offers five flavours – *Classic Salted, Masala Magic, Saucy Ketchup, Pudina Punch* and *American Style Cream & Onion.*

Frito Lays which also makes Indian *namkeen* under the Lehar brand, has launched Meethe Chatpate, a variant of its successful *Lehar Kurkure. Chatpate* is priced at Rs. 10 for a packet of 50 grams. *Lehar Kurkure* which was introduced year ago, has surpassed all expectations, logging a significant volume in the first year, of the total volume of 800 tonnes, according to insiders, Kurkure alone is estimated to have sold 225 tonnes. Encouraged by the market response. Frito Lay's is planning to introduce a whole family of flavours within the Kurkure range soon.

Frito Lay's acquired the Uncle Chipps brand of potato wafers from Amrit Banaspati recently. It has been pushing its Lehar brand of Indian namkeens by launching more variants and smaller pack sizes. According to sources, while Uncle Chipps will be used to take on the unbranded players, Lay's will focus on the premium segment.

The Rs. 196 crore market of chips is growing at 10 per cent annum. Today Frito Lay's enjoys a marketshare of 60 per cent, which is a significant growth from the 24 per cent market share that it had in the early nineties.

INTERBREW

In view of emerging growth opportunities in the beer segment, the second largest brewery in the world Interbrew has plans to enter the country.

Senior officials of Belgium government reported that the company was testing the Indian waters for making its entry and will identify local partners, for manufacturing beer and selling their brands, in the country.

Interbrew is understood to have had extensive talks with Mysore Breweries, a regional player in Karnataka that owns the Knockout brand of strong beer, for collaboration and marketing alliance but no official decision has been taken. Sources said that Interbrew also held talks with the UB group but nothing has come out of it.

Interbrew's brands include *Stella Artois, Jupiter, Labatt Blue* and *Rolling*

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EXPORT ENQUIRIES SOLICITED

Rock and its speciality beers are amber-red beers (*Vieux-Temps, Ginger Ale*), *Abbey beers (Leffe), White beers (Hoegaarden*) and fruit-based beers (*Belle-Vue*). And major brands of Mysore Breweries include *Knockout, Bengal Premium, Pals Premium, Seven Stars* and *MBL*. The company caters to the markets of Andhra Pradesh, Karnataka and Maharashtra. It has two breweries in Aurangabad and Bangalore, with a total combined capacity of 4.5 lakh hectolitre.

As part of its expansion plan Mysore Breweries will be setting up its third brewery in Andhra Pradesh, the fastest growing beer market. It will invest around Rs. 50 crore and will have a capacity of 2 lakh hectolitre.

The company had a turnover of Rs. 100 crore for last fiscal and is growing at a rate of 20 per cent per annum.

MOET HENNESSY

In a move to carve a niche in the wine segment in India Moet Hennessy hopes to bring in a range of quality wines from the best vineyards of the world as a single source supplier. With the market opening up and quantitative restriction removed, Moet Hennessy hopes to dominate the entire wine market.

Wine drinking is an art by itself. Moet Hennessy was responsible for bringing in Cognac, Hennessy VS, VSOP and XO, and Champagnes, Moet Hennessy and Dom Perignon into India.

The wines will be retailed at between $8 and $35, giving a range of options to customers. The wines come from France, Australia, South Africa, California, Italy and Chile.

Jean Pierre Mouiex markets only red wines produced in the Licourne region of France. It is responsible for the famous *Petrus* wine. One of the appellations from this family is the Bordeaux Superior. It has a natural subtlety that allows for early drinking. One year of ageing is usually sufficient.

Another good wine from this house is the Christian Moueix Merlot. A blend of the various wines from the house, it expresses the essence of these grapes in Bordelaise style. The wine is soft, supple, with a beautiful bouquet.

Champy Pere & Cie, is the oldest of the great wine companies in Burgundy, France, Champy has always specialised in wines that originate mainly from the Cote's Or. Gevrey Chambertain, one of the Champy wines, is light with ruby colour and moderate acidity. It has cherries, vanilla and minerals and a good length in a dry finish. Complements all meat dishes and most cheese.

Banfi is from the house of the Italian brothers, John and Harry Mariant who established an innovative wine estate in the Tuscan region of Italy, with Italy's most qualified enologist, Ezio Rivella.

Simi another from Italian house that took its wine making heritage to northern California have stone cellars in Healdsburg, which have for 100 years housed the crushing, pressing fermenting and ageing of Simi wines.

Kanonkop a South African winery in the Stellenbosch area specialise in Pinotage wines. The Beyerskloof Pinotage has a deep purple red colour and delivers intense black and red-berry flavours on the nose.

Trefethen is another California house in Napa Valley. It has won several international awards and Trefethen wines have been served on the tables of 10, Downing Street the residence of the British Prime Minister.

KWALITY BISCUITS

The family run bakery product company Kwality Biscuits, having an authorised share capital of Rs. 2.25 crores has decided to merge four group companies with itself. The group companies are Vajram Traders, Camilla Investments, Malakala Traders, Mytrayasa Traders. The main objects of Kwality Biscuits are carrying out its business as a baker, manufacturer and dealer in biscuits, cakes, breads, buns, cornflakes and other breakfast foods, popcorn, wheat shreds, pastries and flour.

The company through the amalgamation move, hopes to achieve economies of scale including reduction in overhead expenses, efficient and more productive utilisation of labour, streamlined distribution and elimination of duplication services and operation.

It will enable Kwality Biscuits to meet the requirements for further growth, diversification including future strategic alliance, both financial and otherwise.

The merger will also enable companies concerned to rationalise and streamline their management, business and finance and to eliminate duplication of work. "This will result in centralisation of administration," the official added.

All legal and other proceedings pending by or against the transferor companies as well as all contracts, obligations, actions, rights, debts of these companies will be transferred to Kwality Biscuits on the scheme becoming affective. This apart, on the scheme becoming effective, all employees of the four group companies, immediately before the transfer of their undertakings under the scheme, shall become the staff of Kwality Biscuits.

NESTLE INDIA

Nestle India has decided to upgrade and modernise its Moga plant by investing Rs. 80 crore – 20 crore a year for 3 years and 20 crores for expanding the capacity of farm coolers.

To be in line with the needs for new product segments and expanding existing capacities in its products, Nestle is targeting an increase in its daily milk production from the current 8 lakh kgs per day.

The company is also considering entry

into new product segments like butter, yoghurt and flavoured milk. It is launching new variants of noodles and ketchup under the Maggi brand name over the next few months.

Nestle would also be investing significantly in setting up additional lines for some of these products. Besides, it is also gearing up for the launch of its third water brand – *Pure Life* – in the low end segment and expanding the reach of its newly launched Ultra Heat Treatment (UHT) milk soon.

Nestle is of the opinion that transporting liquids with high water content over long distances is not financially feasible and therefore a new facility for UHT milk in Moga is not ruled out.

Ever since Nestle took over its biscuit joint venture in India – Excelcia Foods – from its 40 per cent Indian partner Dabur, the manufacturing facility has been shut and supply discontinued. Now it has decided to out source its biscuit requirements from small scale domestic manufacturing and for that it has approached the government.

Now the focus will be on rationalising manpower and making Excelcia a "low-cost operator" by drawing from various resources available in-house in group company Nestle India.

Excelcia Foods will now be under the overall control of the Nestle India chairman & managing director, Carlo Donati. It is also rationalising manpower and doing away with many posts in Excelcia as part of its overall focus of being a low-cost operator.

BACARDI-MARTINI INDIA

Scotland based '*Grants*' Scottish Whiskey will be soon available in the Indian markets. It will be marketed by the joint venture company between Bermuda based Bacardi & Gemini Distilleries of Mysore.

The deal will help to bring two whisky brands – *Glenfiddich* (single malt) and *Grants* – to the country. This is part of Bacardi's plans to bring all categories of liquors here.

Ashish Misra, marketing controller of Bacardi-Martini India said, "These are high level international brands. We have not thought of any particular strategy to market these whiskeys in India. But we are sure that we will market Grants' brands here in the same way as we did with other brands. This will also help Grants to build their brand in India". According to the pact, Bacardi will develop the market for Grants in the country. The company expects to launch and market the products in India soon.

Bacardi-Martini is keenly looking at bringing in other varieties of Bacardi soon. There are five to six varieties of Bacardi such as Bacardi Lemon, a limon flavoured white rum, Bacardi 8, an eight-year-old dark rum, Bacardi Gold and Bacardi Select both of which are brown spirit rums, Bacardi Solera and Bacardi Breezers, which are ready to drink liquors with a rum base. The total market size of the rum category is 68 million cases and Bacardi has only 2 per cent share of this market in the premium segment. The company is targeting a 15 per cent market share in the white spirit category and 5 per cent in the brown spirit category.

Bacardi-Martini feels that there is huge opportunity to develop the market for their brands.

HINDUSTAN LEVER LIMITED

Bagh Bakri, the largest Tea brand in Gujarat with an annual revenue of Rs 145 crore will soon be taken over by Hindustan Lever Ltd. This will firmly strengthen HLL's position in the domestic Tea industry.

India's second largest player in the tea business, Tata Tea, has decided to drop out of the race and introduce its own brands.

Bagh Bakri has a strong presence in parts of Rajasthan and Madhya Pradesh. It is currently expanding into other neighbouring states.

Piyush Desai of Gujarat Tea Processors, owners of the Bagh Bakri brand did not confirm the deal.

Analysts see the possible acquisition as a positive move by HLL as its garden output would get transferred to a branded output resulting in much higher margins.

VEEKAY ENTERPRISES

Veekay Enterprises has recently diversified from manufacturing of cleaning equipments to marketing of food and beverage products with plans to introduce 4 products named '*QimiQ*' a patent of Harma Food, Austria.

A cream base constituting 99 per cent milk and one percent egg or gelatine, *QimiQ 100* percent natural vegetarian product with a maximum shelf life of nine months, will create a stir in the market. This product, which does not curdle, can be combined with a variety of sweet, spicy, cold and warm food. Due to its longevity of three months without refrigeration, dishes stay fresh, even hours later. Its 15 per cent fat content and neutral taste enhances the natural flavour of the ingredients and it is ideal for whole grain, calorie-reduced or light diets reducing cooking time by 70 per cent. For the benefits of customers, a recipe book will also be made available with each pack of *QimiQ*.

Veekay Enterprises also enters the bottled water segment by introducing *Apollinaries & Schwepps* sparkling mineral water, and for the first time demarcates still and mineral water. The product is packed in white glass bottles for the hospitality industry and commonly available in green glass bottles. The well-balanced mineral content and natural carbonisation makes *Apollinaris* an extremely refreshing, health drink.

Big Apple, another *Apollonaris* product, is an apple drink available in glass bottles and targeted at the younger generation as well as those in the over 40 age bracket. Priced slightly higher than soft drinks the product's unique selling point is its lip-smacking taste and its health drink authenticity. This 100 per cent natural product comes without any added sugar or sweetener and promises to be a sparkling refreshment.

Yet another product being launched by Veekay Enterprises is still water. Procured from Iceland, this one litre packaged product has made use of the right chemicals in the right proportions thus protecting their intrinsic properties. Mehta says that "Iceland Spring mineral water is the best provided at a reasonable price."

HIGHLAND DISTILLERS

When quantitative restrictions will be removed effective April 2001, Indians will soon get taste of things to come. Waiting to enter the Indian market is Highland Distillers, makers of the famous Grouse and Macallan brands of scotch whisky priced at upwards of £1,000 a bottle. Highland Distillers sells its blends and single malts only through five star hotels and duty free shops in India. The company recently set up a liaison office in Delhi in partnership with Remy Cointreau, the French liquor giant with which it has a global marketing alliance.

PARLE AGRO

Prakash Chauhan and Parle Agro's new baby called *Bailley Chotu* – is slated to make a big splash as the country's first mobile mineral water in a 330ml avatar at Rs. 3.50 only. It is the first brand available in mobile packaging in India.

It hopes to not just take on other water tags but actually "expand the Rs. 500-crore organised bottled water market" per se by challenging all softdrink brands. It will provide a convenient, low-priced pure water option to soft drinks –

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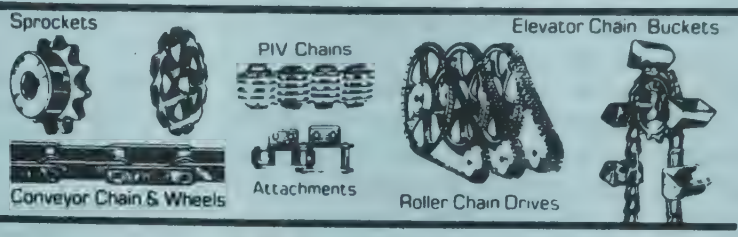

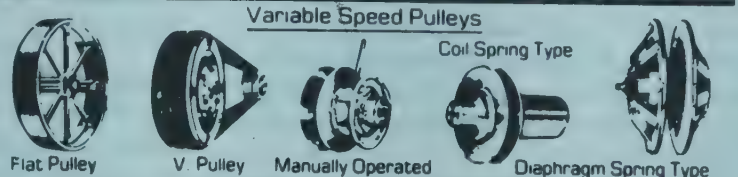

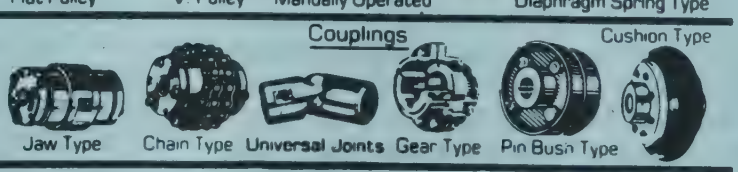

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at the drug store, restaurant or on the road.

The Parle folks have geared up to produce 20,000 cases of *Chotu* a day initially at their various facilities – for all India consumption. The lil' one will pose a challenge to market leader *Bisleri* and the 300-plus small-time players in this ocean.

The small wonder is slated to flow across all cities and towns in the coming months and will even enter North India – a market yet to be touched by Bailley. It will be available to consumers everywhere, from regular outlets to unconventional ones like fast food joints, road side stalls, Udipi restaurant etc.

Chotu will ride Parle Agro's existing direct distribution web of four lakh outlets, and lakh more in the new territory of north India.

Success is definitely inherent in thinking small these days. Everything from chocolates to biscuits, pan parag and shampoos is using convenience packaging to tap a huge market on the move.

The Parle group is into plastics, tetrapacked drinks, water and of course, Bailley soda. About Rs. 250 crore of sales comes from Frooti and Appy and Rs. 100 crore stems from the Bailley brand and 25 crore from PET or plastics. The last promises to also shape up into a very lucrative sphere and this division already provides packaging to names like HLL, other mineral water brands and is also exporting to Sri Lanka and Africa.

AMUL

The Gujarat Cooperative Milk and Marketing Federation (GCMMF), which owns the Amul brands, has signed two separate agreements with Uttar Pradesh and Madhya Pradesh Cooperative Federations for contract manufacture of Amul ice-cream in the Lucknow and Ujjain dairies, respectively.

The move is expected to help the company localise its manufacturing base in northern and central region. All this while, Amul has its ice-creams manufactured for the Northern region through Mother Dairy, Delhi.

Considering the fact that 20 per cent of Amul's ice-cream sales come from the North, the idea behind the Lucknow agreement is to distribute the production capacity between the two dairies, said GCMMF's general manager-marketing R.S. Sodhi. Amul's ice cream sales is expected to touch Rs. 125 crore during the 12 months ending December '00.

The Ujjain agreement will allow GCMMF to cater to the central regions of India where it did not have a partner for manufacturing till now, he added. GCMMF has already tied up with federations in Karnataka, Bihar and Mother Dairy in Delhi. The latest deal will raise the total number of plants for Amul to nine.

For ice-creams, GCMMF has a basic strategy in place: expand the business by tying up with cooperative federations across the country. The rationale: localising the manufacturing base will help Amul distribute the ice-cream at the shortest time possible.

The company is already scouting for partners in the east. Two years ago, GCMMF also bought the Vadilal plant at Tarapore for Rs. 3.75 crore.

MONGINIS

Spread over various cities in the country, Monginis Foods Ltd. (MFL) is now looking to increase its market share by increasing the number of its cake shops almost five times from its existent 253 to 1,200 by 2005. This is part of a fresh marketing and distribution strategy to woo all pastry lovers.

Says Zoher Khorakiwala, chairman and managing director, "We plan to go fully national in the next five years. To keep up with the increased demands, more manufacturing units shall come up and we shall give franchises to increase these units from the present nine to about thirty.

Speaking on MFL being the authorised licensee of Walt Disney for the production of cakes the shape of its characters, Khorakiwal added that the company had plans to capitalise on this asset since the children's segment was among the biggest consumers and influences in the purchase of its products.

UB GROUP

The UB Group chairman Vijay Mallya is brewing a heady mix of new brands, products and acquisition in a bid for 50% plus share of the Indian beer market by 2001. In a gambit to exploit and extend the brand equity of some of its powerfull brands, the UB group will shortly launch beer brands under the McDowell and Bagpiper labels. Hitherto, McDowell and Bagpiper have been the flagship spirits (liquor) brands of the group.

The Bagpiper beer will be launched by Herbertsons and the McDowell beer brand will be introduced by McDowell and Co. UB will be launching a light beer or a diet beer called '*Kingfisher Sport*.' This beer, with three or less than three per cent alcohol content, is likely to be introduced to tap the diet–conscious segment of the market.

UB is also in discussion with Shepherd Neam of UK to introduce one of its brands, '*Spitfire*', in India. "There is a market for traditional English ale in India, especially in cities like Bangalore and Mumbai," said Mr. Mallya.

UB Ice, which was launched as a niche product in the Bangalore market is small bottle, is now going national and in large bottles as the market response has been good.

UB had acquired a majority stake in Associated Breweries & Distilleries and now has access to San Miguel beer.

After its runaway success in beer and hard liquor market the UB group is positioning McDowell International Brands, a subsidiary of McDowell & Co. in the wine segment. The liquor major believes that there is a very big franchise for wine in the country. This category is growing very fast. There are also strong indications that consumption of wine is rapidly gaining social acceptance and women are consuming more of the bubbly. Mr. Mallya said. "We intend to import bulk wine into the country, bottle and market it in India.

The company is said to be leaning more towards sourcing its wine requirement from South Africa and California. McDowell & Co. has a presence in the wine market through its alliance with the Italian wine maker, Bosca.

Globally wine is a growing category. The wine market in the country is estimated at 1.5 lakh cases per annum. This is excluding the lower segment which is dominated by very low priced products like port wine. This liquor is very popular in markets such as the tourist paradise of Goa.

The big markets for wine in India geographically are Maharashtra, Tamil Nadu (mainly for value wines), Karnataka, metropolitan Calcutta, Goa and Pondicherry. Wine, at present has a very limited market in the country. But indications are that this segment has strong possibilities for growth.

McDowell International Brands was floated by the UB Group to mainly market international brands in India. The company has entered into a slew of agreements with global brands like Drambuie, Bols and other, with a view to market their products in the country.

SULA VINEYARDS/KERRY DAMSKEY

Californian Wine maker Kerry Damskey will raise a toast to India soon with the launch of two exclusive wine brands – Sula Chenin Blanc and Sula Brut. These wines are being produced for the first time in India by Sula Vineyards in Nasik, in collaboration with Kerry Damskey.

Sula Chenin Blanc, priced at Rs 420, is produced from 100 per cent

Chenin Blanc grapes and is light, fresh and fruity in character. Sula Brut, a sparkling wine, on the other hand, is made of a proprietary blend of three different kinds of white grapes harvested by hand. It is priced at Rs. 540. These wines will be initially available in Mumbai.

UNITED DISTILLERS & VINTNERS

The 1 billion United Distillers & Vintners (UDV) has become the first company to launch flexi packs for its Gilby's *Green Label* whisky. Encased in bottled green and a rich label with gold trimmings, Gilby's *Green Label* flexi-packs will be launched at an introductory price of Rs. 38 for a 180ml pack.

UDV's six-year-old subsidiary Gilby's *Green Label* is estimated at 2 million cases currently and is the No.3 brand in the regular whisky category. The regular whisky category in India is estimated around 20 million cases.

The packs have a unique, tamper proof spout that prevents spillage. Says UDV's marketing controller Mohita Arora: "The new stylish and contemporary flexi-pack offers a distinct competitive advantage for Gilby's *Green Label*. The UDV has chalked out an innovative marketing strategy to launch this new category in liquor packaging.

The company will be marketing the product solely through its distribution network and has designed various means to merchandise its new flexi-packs, customising them according to the size of the outlets.

For the big-sized outlets, the company has designed countertop dispensers to stock the packs, other than the backlits. For the mid-sized outlets, there will be basket air wire racks, which are generally used by the retailers to stock chips packets etc. And for the small outlets, the company will put up air polysleeves to stock the flexi-packs.

MOTHER DAIRY

The Rs. 1,000 crore cooperative sector Mother Dairy Fruit and Vegetable is on a roll, with a fast-track growth plan for every area of its business.

Its flagship brand *Safal* is expanding to include bread, pulses, spices, in its existing range of frozen vegetables, peas, jams, squashes, ketchups, pickles, dahi, flavoured milk and fruit-based drinks. Volumes of its newly launched Dahi alone are expected to touch 2,500 tonnes annually.

Set up as a new company in April past, after the merger of NDDB's fruit and veg project with Mother Dairy, the NDDB subsidiary has been given complete commercial independence. Consequently, the company has decided to strengthen its backward and forward linkages, improve distribution networks, enter new markets, and expand product range.

The company is focussing all its energies on the markets in and around Delhi and Mumbai. New distributors and franchisees are being roped in to ensure that Safal products are available in every neighbourhood of Mumbai soon. Attempts are also on to get more franchisees for manufacturing Safal products without compromising on quality.

Though there are no plans yet to expand Mother Dairy ice cream from Delhi to other northern cities because of sister company Amul's extensive presence, the brand already has 45 percent of the Capital's market.

WEIKFIELD AGRO

Weikfield Agro Products, a joint venture between the city-based Weikfield group and the US-based Franklin Mushroom Farms Inc, plans to enter value-added mushroom exports. The exports include marinated mushrooms, mushroom salads, mushrooms blended in different curries and sauces.

Weikfield has a capacity of 10 tonne of fresh mushrooms per day, out of which 10-15 per cent is sold in the domestic market and the balance is processed and exported mainly to the US market.

However, with the aim to increase its profit margins, the company is now looking at increasing its retail sales as the institutional sales give only volumes but not the margins that the company is looking for. Institutional sales bring in 10 to 12 per cent profit margin, while retail sales could increase this substantially.

Besides this, exporting fresh mushrooms can also improve the company's sales realisation by 25 per cent, particularly in the European market where the demand for fresh mushrooms is very high. Weikfield's processed mushrooms are sold to large retail food and restaurant chains in the US, such as "California Gold" and "Liberty Gold", through institutional sales.

SHAW WALLACE & CO.

Shaw Wallace & Co. has plans to restructure the company in 3 separate companies – one holding all breweries assets, second holding all the distilleries while the main company will own all brands. This is done to consolidate the company's business and its position in the fast expanding beer segment.

Shaw Wallace currently has eight breweries of which three, Sica Breweries, Skol Breweries and Haryana Breweries, are being merged as the first step. The remaining five will also be merged with Shaw Wallace Breweries over successive months, subject to court approval. It also has strategic alliance with 11 breweries, but it is still uncertain how

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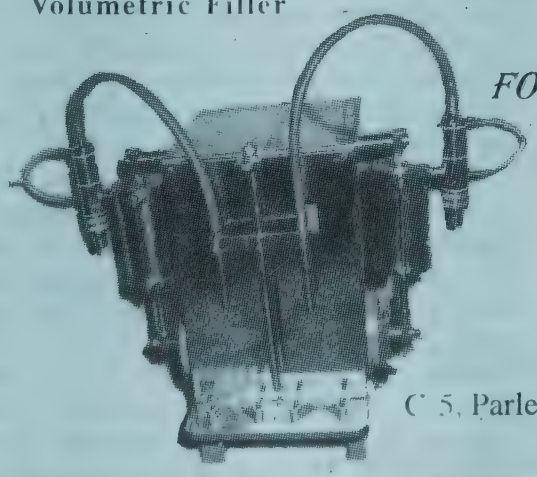

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the arrangement with alliance partners will be worked out.

The company also has 14 distilleries which will be merged under Shaw Wallace Distilleries and the process is expected to take one more year.

It is also learnt that chairman of Shaw Wallace Manu Chhabria has joined hands with his brother Kishor to counter Vijay Mallya who spearheads the UB Group.

SWC has introduced in India, mega bottles of 2 litres, christened *Royal Challenge Premium Whisky* priced at Rs. 1,200/-. The mega liquor bottle of two litres is elegant yet bold and will be a collector's delight.

Strong Beer Major, Shaw Wallace & Co has decided to consolidate its position in European countries. It will launch its beer in the US market under the brand name *'Kohinoor'. Kohinoor* will be produced and bottled in India and exported to US.

SWC had earlier launched its beer *Lal Toofan* in the United Kingdom in 1993. which has enjoyed remarkable success and had since been extended to other markets like France. According to sources, SWC will take the ethnic Indian route to market the beer in the US market — the same route it took to market *Lal Toofan* in Europe.

SWC is also on the lookout for a bottling unit in the United Kingdom for its whiskey *Royal Challenge*, the source added.

The company has a string of beer brands in its stables including *Haywards 5000* and *Royal Challenge*. It is the largest player in the country in the strong beer segment with a market share of over 50 per cent, according to SWC sources. The company's share of market is almost 25 per cent now.

MILLENNIUM ALCOBEV

Millennium Alcobev will soon acquire Black Knight Whisky brand from Mohan Meakins. Black Knight has a strong regional presence in the north.

Millennium Alcobev was set up by the UB group in partnership with former Shaw Wallace managing director Ravi Jain, millennium Alcobev currently has a presence in the beer market and is planning to enter other segments like whiskey, rum and vodka.

The company plans to foray into these segments to have products in all ranges, and position them against Shaw Wallace.

Even after Millennium Alcobev buys the Black Knight brand, the whiskey will continue to be manufactured at Mohan Meakins manufacturing unit.

The company already has a production-sharing arrangement with Mohan Meakins. As per the existing agreement, it will be using four units of Mohan Meakins to bottle its products.

COCA-COLA

Beverage giant Coca-Cola Co will begin marketing milk drinks for children younger than 12 years soon. 'Project Mother' is what the company is calling its initiative to develop milk drinks.

Coke planned to test more than five types of milk-based products directed at kids according to the company's head of innovations, Victoria Reid. Coke will test the drinks in Europe, Latin America and the United States.

BECK & CO. GROUP

Brauerei Beck & Co established a new sales record in its 1999/2000 business year: the Bremen-based brewery posted a six-percent rise in sales of beer, with export sales up almost ten percent. Sales of the regional "Haake-Beck" brand were firmer than in previous years.

Despite the encouraging figures for the past business year, the company and its major affiliates – Bremer Erfrischungsgetränke GmbH, Nienburger Glas GmbH and Rostocker Brauerei GmbH – reported more modest expectations for the current 2000/2001 business year. Although the company's directors expect earnings to be slightly up on the previous year, it is unlikely that the volume of sales will match last year's record level.

Due to poor weather in the first months of the new business year, sales volumes were well below those of last year. Sales have also suffered from the continuing decline in values in the "beer" category in Germany, as well as from fiercer competition on international markets. In June 2000, Beck & Co took an important step to counter the unsatisfactory trend in returns throughout the industry by raising prices for its "Beck's brand"

In the past business year (July 1999 to June 2000) the Group succeeded in raising sales volumes across all market segments. Sales of beverages, for example (including licensed production) rose by 5.2 percent to 8.735 million hectolitres (98/99: 8.632 million hl.). Beer accounted for 5.743 million hl. of this total (98/99: 5.437 million hl.). The international premium

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brand "Beck's" grew by an average of about seven percent world-wide and was therefore able to continue the success of the previous years. Sales of beer produced under license fell from 481,000 hl. last year to 163,000 hl. – mainly as a result of tougher competition on the Chinese market.

Sales of non-alcoholic beverages amounted to 2.829 million hl. After adjustment for sales of Victoria Heil-und Mineralbrunnen GmbH, which Beck & Co sold in November 1999 as part of a management buy-out, the Group posted growth of 7.3 percent in this segment, Nienburger Glas GmbH raised unit sales by 8.5 percent and was thus considerably more successful than the market as whole.

The Group's consolidated turnover was 3.7 per cent up on the previous year to stand at DM 1,664 million (98/99: DM 1,605 million) Of this total, beer accounted for DM 1,028 million (98/99: DM 983, million) non alcoholic beverages for 353 million (98/99, DM 339 million) and bottle glass for DM 245 million (98/99: DM 238 million).

POONA BOTTLING CO.

Poona Bottling Company Ltd., a one-time franchise beverage bottling company of Coca-Cola India promoted by the Mores, has served a legal notice on the Atlanta-based soft-drink major, for dishonouring a business purchase agreement entered into in 1999 for acquiring PBC's business undertaking, thereby causing it wrongful loss

Coca-Cola and its directors have been given 15 days time to reply to the notice, failing which a criminal case will be filed, PBC's advocate CL Sareen said recently. Coca-Cola officials were not available for comment.

The notice filed recently by Sareen has been served on Hindustan Coca-Cola Beverages Pvt. Ltd. (HCCB), a wholly-owned subsidiary of Coca-Cola South Asia Holdings, the president and CEO of HCCB and its board of directors, the parent firm Coca-Cola Company (CCC) and its board of directors, Coca-Cola India Ltd., a 100 percent arm of CCC in India and its president and CEO.

The PBC had been operating as a franchise of Parle Exports Ltd., bottling and marketing. Parle's soft drink brands till 1993 through a 10-year agreement entered into in 1988. On September 20, 1993, Coca-Cola, which had just returned to the Indian shores after its exit in 1977, entered into a licensed agreement with PBC keeping the expiry date as November 25, 1998, but with an assurance that the agreement will be renewed. In between, PCB also made an investment of around Rs 30 crore to upgrade its bottling facility. Coca-Cola and HCCB are now being accused of writing to the promoters of PCB that after their agreement expired on November 25, 1998, it was willing to enter a contract packing agreement for a term of 18 months, while purchasing PBC's bottles and crates bearing trademarks of CCC upon expiry of the license.

Additionally, it also gave PBC the option to sell its promotion assets to Bharat Coca-Coca Bottling South West Pvt. Ltd. (now merged as HCCB) at the end of the 18 month period in return for a small shareholding in CCC.

Faced with the threat of being left with no business after the expiry of the 18 month license period, the Mores decided to discuss a sell-out with CCC and signed a memorandum of agreed points with representatives of Coca-Cola India on March 26, 1999.

SEAGRAM INDIA

Seagram India, a company with 100 percent foreign investment, has acquired the entire stake in Oceanic Distilleries, a non-molasses based distillery in Nashik, Maharashtra. Though Seagram had informed the Foreign Investment Promotion Board (FIPB) about the takeover, the board has not approved the deal.

Seagram has got the distillery licence of Oceanic endorsed on its name by the Government of Maharashtra, while the company has also been granted a bottling licence in its name by the state government. Seagram officials say that the company is not required to get the FIPB's approval in light of a Supreme Court judgement in the case of Bihar Distilleries vs Union of India, and others, that jurisdiction over industries engaged in the production of potable alcohol rests with the state government. In fact, the Centre is now working on a new policy that will transfer all licensing powers to the states.

However, officials in the Union industry, which is the administrative ministry for liquor as well as licensing issues, say an FIPB nod is mandatory for any acquisition of shares in an Indian company by a foreign firm as it involves foreign investment.

They insist that Seagram is yet to get an approval like several other liquor firms such as Bacardi and Whyte & Mackay. In other words, though Seagram is free to ask a state government for a distillery licence, it has to go through the FIPB if it acquires a company in India, the officials say.

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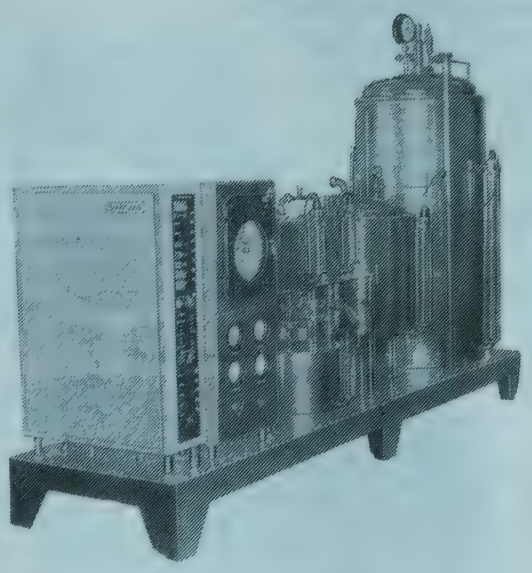

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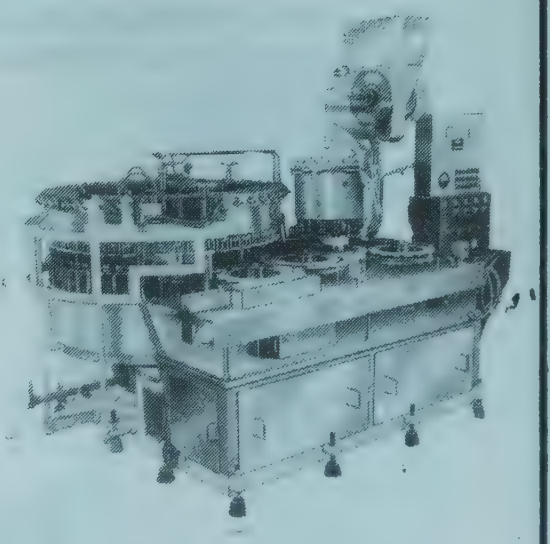

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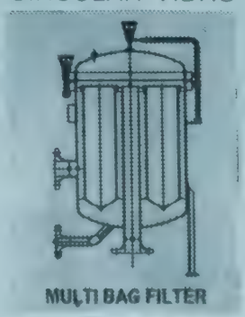
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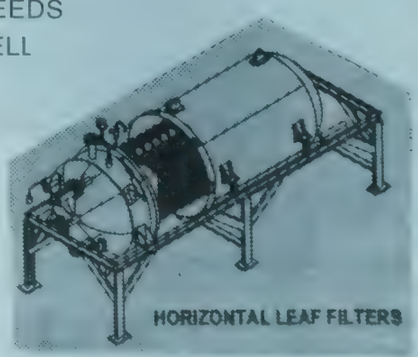
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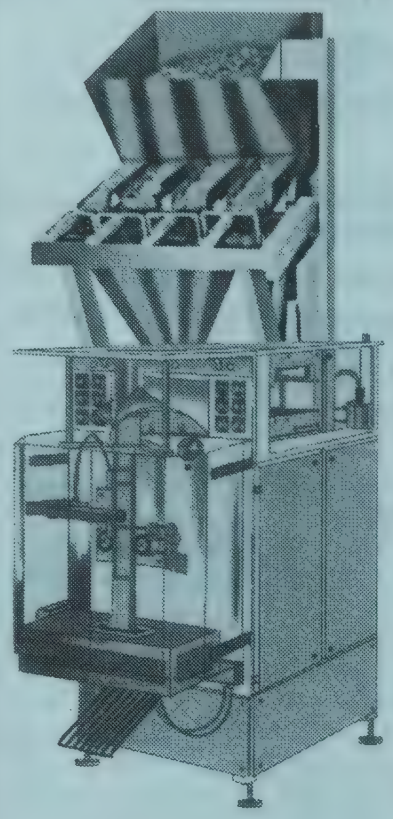

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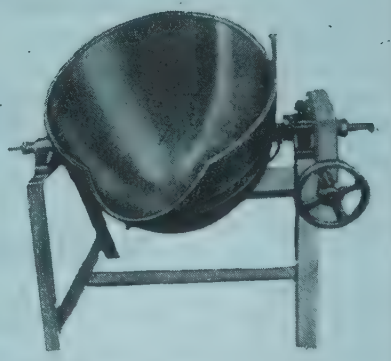

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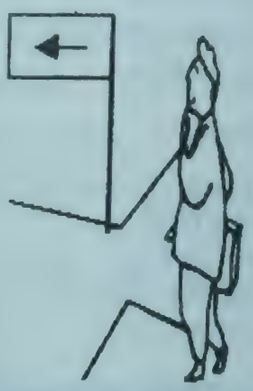

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EXPORT HIGHLIGHTS

VEGETABLES

Spices Trading Corporation (STCL) has successfully negotiated and secured a Rs. 5 crore export order of red split lentils, onions and potatoes to Sri Lanka.

According to KC Ponnana, managing director, Spices Trading Corporation, the corporation had for the past one year been aggressively pursuing a deal with CWE, Sri Lanka to source all their requirements from Spices Trading Corporation directly without involving middlemen on a government-to-government basis.

During the recent visit of Reggie Ranatuge, Sri Lanka minister for food and marketing development, the corporation had signed a memorandum of understanding (MOU) with CWE, Sri Lanka for the export of spices and other agricultural commodities like onion, potato, red split lentils, wheat, sugar. The MOU signed will be valid for two years which will help both countries to export and import quality products at competitive prices.

PROCESSED FRUITS

ITC is now entering into exports of processed fruits like mango pulp. This was indicated by Sisir Kumar, CEO, ITC (international business division). The division accounts for Rs. 500 crore of ITC's annual turnover. The target is likely to treble to Rs. 1,500 crore by '04-05, Mr. Kumar said. The processed fruits are to be exported to supermarkets in the US and Europe. ITC would not invest in setting up processing plants but will use the existing infrastructure whose capacity is under-utilised. ITC's IBD plans to boost exports of the other commodities it is trading in. ITC generates around Rs. 50 crore from the 8,000 tonnes of coffee it exports. every year. The IBD now plans to increase coffee-export volumes to 20,000 tonnes by '04-05.

MARINE PRODUCTS

International market witnessed a steady growth of Indian marine products. Export of marine products in the current fiscal is expected to exceed the target of Rs. 5,500 crore.

Conditions in the international market are favourable to India. Export of Indian prawns to the US increased — it touched Rs. 2,344 crore during April-September — after a virus infection wiped out 40 per cent of the Venezuelan production of shrimps and prawns.

Prawns accounted for 78 per cent of the revenues from marine products exports. Value addition of marine products, which was hitherto neglected, is also picking up. India achieved a growth rate of 60 per cent this year in this area. Production of Surumi (A product made out of fish varieties having poor demand in the global market) is on the increase. Six years ago, India exported 1,500 mt of surumi.

During the last fiscal, the export had increased to 11,000 mt, with growth in international demand, especially in Japan. In tonnage terms, 1,40,491 mt of marine products were exported during April-September — an increase of 32 per cent over the same period last fiscal. Japan was the top importer accounting for products worth Rs. 1,303 crore during April-September, followed by the US and European Union.

Among the recent policy initiatives taken to boost exports of marine products is the scheme for providing financial assistance to entrepreneurs for acquisition of refrigerated trucks/containers for transporting marine products from auction centres to the processing plants with a view to preventing deterioration of the quality of the raw materials during transit. Government also approved the proposal to extend subsidy of 50 per cent of the capital cost (excluding civil constructions) involved in the setting up of Polymerase Chain Reaction (PCR) testing laboratories in hatcheries, subject to a limit of Rs. 5 lakh per hatchery.

RICE

Encouraged by good wheat sales, the government has decided to export rice in order to reduce its bulging stocks. The country has a carry over stock of 13.2m tonnes of rice and needs storage space for the fresh crop, hence government is in a position to export 3 million tonnes of rice. The FCI is working out a price at which the commodity can be exported. It is likely that the price offered for exports would be at a subsidised rate as in case of wheat and a decision will be taken soon.

Analysts said India needs to bring down the price of common rice of 25 per cent broken quality to $150 a tonne against the current domestic price of $200 a tonne to make exports competitive.

"Pakistan is selling rice at $145 a tonne which is almost the same quality as ours. We need to offer a price of $150 to make people switch to India from their traditional sources," one analyst said.

Rice exports are expected to be about one million tonnes in '00-01 (July-June) against 1.7m shipped out a year ago, dealers said.

WHEAT

The Indian Government decision to reduce the export price of wheat, has resulted in heavy demand for the agro commodity. Countries like Iraq, Bangladesh & Malaysia now look to India for their wheat procurement.

According to government officials, deals for more than 500,000 tonnes has already been finalised with various countries and talks for more such deals are underway. The state-run canalising agency, MMTC already finalised contracts of about 150,000 tonnes of wheat.

This wheat would mainly be traded to immediate neighbour, Bangladesh through trading agents located in Bombay and Calcutta. The entire amount would be transport by rail and the first shipment would be ready soon. The official added that the government was getting very good response from West Asian countries Iraq and Iran.

India has also recently received export orders of 350,000 tonne from Iraq under the United Nation Oil-for-Food programme. According to officials in the petroleum ministry, India has approached the United Nations to seek permission to exchange foodgrains for oil with Iraq which is facing sanctions from the international community.

Preliminary discussions were also on with Saudi Arabia and Malaysia, the official stated and added that while Malaysia was currently in need of wheat, Saudi Arabia has been wanting to import wheat for a long time.

TRADE FAIRS & CONFERENCES

31st INTERNATIONAL SWEETS & BISCUIT FAIR
Venue: Cologne, Germany
Date: 28-31 January, 2001

International Sweets and Biscuits fair is setting new standards as the leading fair for the confectionery industry. It occupies an outstanding position for the confectionery industry and brings together manufacturers and buyers from all over the world. Trends in the confectionery and snacks range will be the main theme of the ISM.

With its almost complete range and its unique internationality, International Sweets and Biscuit Fair is the undisputed pilot fair for confectionery industry. About 1,500 suppliers from all over the world are expected at Cologne. Exhibits at the fair will be end products exclusively intended for retail sale. The spectrum of the product groups cover chocolates, sugar goods, baked foods, snack products and raw pastes.

For details, please contact:

Christine Hackmann, KölnMesse GmbH, Messeplatz 1, D-50679 Köln Postfach 210763, D-50532 Köln. Tel: +49(0)221/821-2288, Fax: +49(0)221/821-3417 Email: c.hackmann@koelnmesse.de Website: www.koelnmesse.de/ism

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PET Resin & Fibre Markets
Venue: Dubai, UAE
Date: 12-13 February, 2001

CMT's timely 3rd Mideast, Africa & South Asia PET Resin & Fibre conference brings together leading industry players to discuss on current issues and assess the impact of the region's aggressive expansion on global market balances.

Growth for polyester fibre markets looks positive with polyester continuously displacing cotton and other fibres. Consumption of PET packaging resin is expected to rise from an estimated 321,000 tons for this year to 804,000 tons by 2009. Significant investments is also seen in downstream resin processing capacity. It is expected that the PET packaging business will grow.

PET resin and polyester fibre producers, PET bottling companies Preform and Closures producers, Equipment/ Technology Suppliers, Packaging companies,etc. will come together at this Conference.

Fore more details contact:

Ms. Cynthia Yeo, Event Manager, 80 Marine Parade Road # 13-02 Parkway Parade, Singapore 449269. Tel: 65-3469132, Fax: 65 3455928 Email: cynthia@cmtsp.com.sg

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BIO FACH 2001
Venue: Nurnberg, Germany
Date: 15-18 February, 2001

Organised by Nurnberg Messe, Bio-Fach 2001 promises to be the leading fair for natural food and food products. With the sustained and unrestrained boom in organic products worldwide, this exhibition will be the meeting place for exhibitors and traders from trading chains, health food shops and natural food stores.

The exhibition also offers the best that money can buy in the delicatessen sector: pesto, balsamico, dried marinated tomatoes, wild salmon, pickled mushrooms, aromatic salad oils from walnuts or grape pips, even truffles and morels – and all this in organic quality with the full original taste.

The range of products: Organic Food (raw materials, semi-finished products) • Convenience food • Frozen food • Organic drinks • Services • Farm shop supplies • Farm and garden • Natural Cosmetic

Approximately 1500 exhibitors will take part and 18,000 trade visitors will be attending the fair.

For details, please contact:

Nurnberg Messe GmbH, Messezentrum, D-90471, Nurnberg. Tel: +49(0)911-8606-0, Fax: +49(0)911-8606-288. Website: www.biofach.de

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AgriExpo 2001
Venue: Lucknow, India
Date: 17-20 February, 2001

The event offers a great marketing opportunity for participants to showcase products, services and technologies to potential buyers and users and also help establish contacts with the government agencies and prospective investors, identify business opportunities and forge strategic alliances with agribusiness companies.The Exhibition provides a unique opportunity for the agribusiness companies to exhibit their products and directly communicate with a large number of potential customers, government officials and business associates.

AgriExpo seeks to provide exposure to farmers about latest agri-input products, new technologies, farming practices, government schemes and scientific knowledge, which would help them raise the agricultural productivity and produce quality through adoption of modern farming practices.

Participating sector profile: Fertilisers & Micro-nutrients • Seeds & Biotechnology • Pesticides • Farm Machinery • Food Processing • Dairy and Poultry • Horticulture & Floriculture • Agricultural Research and Consultancy • Meat & Meat Products • Sugar and its By-products • Banks & Financial Sector • Miscellaneous. A total of about 100,000 visitors are expected for the event.

Fore more details contact:

AgriExpo 2001, G-31, Lajpat Nagar-II, New Delhi 110024. Tel: 6910927, 6910928, 6316747, Fax: 6849107, 6922747 Email: agricult@del3.vsnl.net.in

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Food Irradiation 2001
Venue: Washington
Date: 26-28 February, 2001

Intertech's 5th International Food Safety Conference "Food Irradiation 2001" discusses effective solutions for meeting consumer demand for safe, Pathogen-free food. Safe food supply is the food industry's top priority, and the key to combat food borne pathogens to ensure safe food is irradiation. Food Irradiation 2001 conference addresses the latest market, technical & regulatory trends for food irradiation. It will give practical advice from irradiation providers on reducing processing costs, improving products distribution, and establishing new quality standards. This conference provides a balanced as-

sessment of the consumer education needs, technical opportunities and the evolving markets that are waiting to be tapped.

Fore more details contact:

Intertech, 19 Northbrook Drive, Portland, Maine 04105. Tel: +207-7819800, Fax: +207-7812150 Email: info@intertechusa.com Website: www.intertechusa.com

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SIAL 2001
Venue: Montreal, Canada
Date: 4-6 March, 2001

A biannual worldwide exhibition dedicated exclusively to food products beverages, wines and spirits, offers international food products suppliers a platform where they can meet professionals from the field of distribution, commerce and catering and the fast expanding market of North America and South East Asia.

About 500 exhibitors are expected to take part and 12,000 visitors are expected to visit the exhibition.

For details, please contact:

Anne Capdevielle. Tel: 33(0) 149 68 5682, Fax: 33 (0) 149 68 5632. Email: acapdevielle@exposium.fr

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PROWEIN 2001
Venue: Düsseldof, Germany
Date: 4-6 March, 2001

Organised by Messe Düsseldorf Prowein 2001 is the international trade fair for wine & spirits. Almost every wine producing nation will be represented at the ProWein, thus impressively underlining the importance of the role of fair as a marketing medium for both producers and consumers. A special highlight of this fair is the international wine tasting session. About 2,500 exhibitors will display Red wines from leading varieties of international "wine growing area, White wine with ageing potential and Fruit brandies.

Fore more details contact:

Press Department ProWein 2001, Monika Kissing/Tanja Karl. Tel: +49211-4560543/465, Fax: +49211-4560 8548 Email: kissingm@messe-duesseldorf.de KarIt@messe-dusseldorf.de

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B + D SHANGHAI 2001
Venue: Shanghai, China
Date: 6-9 March, 2001

Organised by Messe Munchen in collaboration with China Light Industry Machinery Association and the Technical Association for Food and Packaging Machinery - Germany, B + D Shanghai is fast becoming one of the leading trade fairs for brewing and drinks technology in Southeast Asia.

B + D Shanghai 2001 will feature a new concept as a modern, future-oriented trade fair for drinks technology. It will present the latest technologies for the production, bottling and packaging of all drinks – from beer, non-alcoholic beverages and mineral water through to "liquid food"

In addition to the latest machines and systems for the production, bottling and packaging of drinks, B + D Shanghai 2001 will present new techniques for process automation and quality control as well as raw materials and auxiliary materials.

For details, please contact:

Messe Munchen GmbH Messegelande, D-81823, Munchen. Tel: (089) 949-20600 / 949-20601, Telefax: (089) 949-20609, Email: info@messe-muenchen.de, Website: http://www.messe-muenchen.de

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FOODEX JAPAN 2001
Venue: Tokyo, Japan
Date: 13-16 March, 2001

Foodex Japan enjoys the reputation of being the top event in the Asia Pacific Rim for its quality and scale, offering its participants fantastic business and sales opportunity.

Foodex Japan 2001 is an ideal trade show where exhibitors, producers meet face to face, introduce their products and do business with potential buyers from world over. This trade show is the only promotional medium where visitors can see, taste, smell, hear and touch the products, the perfect gateway into a lucrative market.

Exhibits at Foodex:

Food:- Agricultural products, Bread and Cereals, Confectionery, Dairy products, Delicatessen items, Eggs and Poultry, Frozen food products, Herbs and Spices, Ingredients, Meat and meat products, Oils, Seafoods, Seasoning and condiments, Soup stock.

Beverage:- Beer, Brandy, Liqueur, Spirits, Whisky, Wine, Coffee and Tea, Fruit Juice, Mineral Water, Soft drinks

For details, please contact:

The Secretariat of Foodex Japan 2001®, C/o Japan Management Association, 3-1-22, Shiba-Koen, Minato-ku, Tokyo 105-8522. Tel: 81-3-3434-0093, Fax: 81-3-3434-8076

GLOBAL FOOD TECH 2001 AND GLOBAL EXPO 2001
Venue: Goregaon, Mumbai
Date: 12-16 April, 2001

The Global Food Tech 2001 and Global Expo 2001 aim to bring together product and technology from all over the world under one roof. This mega event will make available the different sources of information of the latest development of Technology in the field of Food

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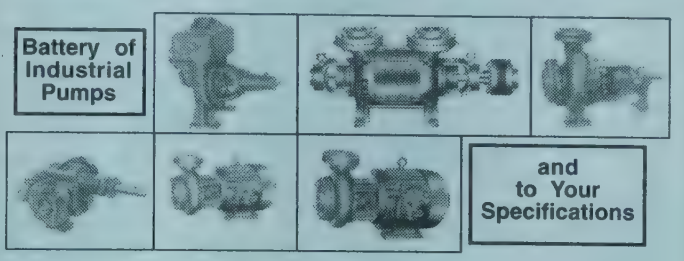

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Food Tech is an event dedicated to the latest product innovations in the food and drink industry. Global Food Tech 2001, will be Mumbai's event of international repute with more than 300 exhibitors from entire food and beverages, hotel technology, dairy industry. Food Tech 2001 is designed to provide the unique marketing opportunity.

Exhibitor's Profile: • Processed foods • Dairy products • Beverages • Breweries and wine • Fresh Frozen Foods • Ice cream and desserts • Sea food • Confectionery • Spices • Bakery products • Canned foods • Food processing • Machinery and Equipment • Packing Material • Dairy Machinery and • Equipment • Canteen Equipment • Beverage / Soft drink • Printing • Labelling / Marking • Wrapping machinery • Canning Technology • Food ingredients / Additives • Storage systems • Refrigeration / Freezing • Equipments • Bottling Technology • Instrumentation, Testing • Quality control • Liquid handling • Waste / Water Treatment • Measurement and Weighing • Process control • Technology • Agriculture supplies.

Global Expo 2001 conference agenda has been drafted with the intent to provide valuable insight into the development in the food industry, to study the past market trend, analyse and forecast accurately future trends, and make available critical information on technologies strategies for successful implementation of plans.

For details, please contact:

Global Foundation, 12/260 Samudradarshan Co-operative Society, D.N. Nagar, Andheri (W), Mumbai 400 053. Tel: 6235154, Tel/ Fax: 623 5153, Email: globalf@hotmail .com / eglobalexpo@hotmail.com, Website: eglobalfoundation.org

IDFT EXPO 2002

RESTROSPECTIVE

The International Dairy and Food Technology Expo jointly organised by KolnMesse International & Tafcon Projects (India) Pvt. Ltd. supported by DLG-German Agricultural Society was held from **October 03-05, 2000 at Pragati Maidan, the prestigious Exhibition Complex**. Represented at the Expo were leading players in the field of Dairy & Food Processing from countries like Australia, Belgium, France, Italy, Japan, Switzerland, The Netherland, Taiwan, UK and hosts India. The Group participation from Germany highlighted the sophisticated technologies in the fields of Dairy and Food Processing. On the Indian side the State of Andhra Pradesh focussed attention on the development of dairy and food processing in India as the Partner State.

Highlighted in the display were a variety of equipments for Food, Brewery Beverages, and Dairy Industries, Fruits & Vegetable processing Machines, Meat processing machines, Cooling and Refrigeration technologies, Truck Refrigeration units, Milking Machines, Cheese and Butter making Machines, Automation dryers, Dairy & Food Packaging Machinery including flexible packaging material etc.

The visit of an official Delegation under the leadership of Dr Gerald Thalheim, German Federal Minister of State for Food, Agricultural & Forests from Germany heralded a new dimension to the Indo-German trade and economic relations.

The Expo opened up one to one interaction, Joint ventures and business collaboration. The technical seminars on "the challenges in Dairy Production in India in the New Millennium" and "Development of Food Processing & packaging" also discussed in detail the level of technologies used in the sectors and the vast scope for adopting new and latest technologies.

Dairy development in India has been acknowledged the world over as one of the modern India's most successful developmental programme. Currently the consumption accounts for 46% of the total production of 78 million tonnes of milk and the remaining utilised for conversion to milk products. The industry has also introduced a number of new products such as casein, lactose, dairy whiteners, different varieties of cheese. India is also exporting milk products besides the traditional products.

The Dairy sector holds high potential for introducing new technologies and skills of management to achieve high productivity in dairy animals.

Food Processing Industry, the sunrise sector in India is a US $61 billion industry, offering the production facilities of over 800 flour mills, 412 fish processing units, 9500 fruit/vegetables procesing units (including 656 sweetened aerated water units, 114 meat processing units, 90 milk products, 429 sugar mills, 725 solvent extraction units and several food processing factories in the organised sector and a 169 million hectare of arable land — all add new deminsion, to the potential for growth.

The public, private cooperative sectors and the international sector companies have all to play their respective roles for the rapid growth of the sector.

The seminar on Dairy Development organised by the TAFCON group was attended by 220 participants while the Seminar on "Development in Food Processing and Packaging Technology was organised by All India Food Processors Associations in collaboration with TAFCON Group.

SIAL ASIA
Venue: Singapore
Date: 5-8 June, 2001

Recognised by Singapore Trade Development Board and Singapore Exhibition & Convention Bureau, SIAL offers the gate to Asia through intimate experience in globalisation strategy.

SIAL Asia is an ideal platform to launch new products, innovative production processes & techniques.

Exhibit profile: Alcoholic Beverages • Children's Food & Health Food • Convenience Food • Cured Meats • Dairy Products, Eggs • Delicatessen Products • Food Ingredient • Fresh & Semi-Preserved Fish, Molluscs & Shellfish • Fresh Fruit & Vegetables, Dried Fruit • Fresh Meat & Offal • Fresh Poultry & Game • Frozen Food • Grocery Products (Including Pulses & Pasta) • Halal Food • Horticulture • Non-Alcoholic Beverages • Organic Products • Pet Food • Private Labels • Product for the Catering Sector • Professional Services & Federations • Tinned Products & Other Preserved Products.

For further information, contact:

SIAL Asia Pte. Ltd. 20 Kallang Avenue, 2nd Floor, Pico Creative Centre, Singapore 339411. Tel: 65 3929269, Fax: 65 3929260 Email: efepl@pacific.net.sg Website: http:// www.sialasia.com or http:// www.sial.fr

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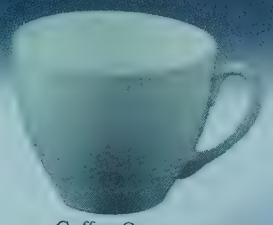
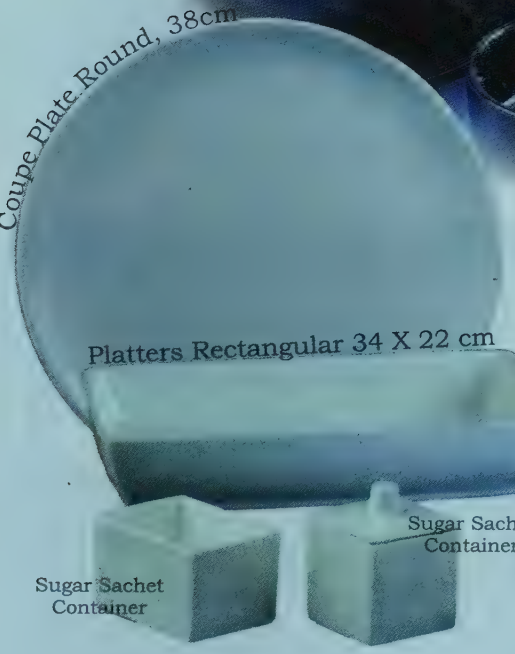
Table Top China


Coffee Cup

Creamers


Coupe Plate Round, 38cm

Platters Rectangular 34 X 22 cm

Sugar Sachet Container

Sugar Sachet Container

Sugar Dish Double, 7cm

Plate Oval, Rim-40 cm

Plate Oval, Rim-47 cm

Plate Oval, Rim-35 cm

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BOOK REVIEWS

BUBBLES IN FOOD edited by G.M. Campbell, C. Webb, S.S. Pandiella, and K. Niranjan. Published by American Association of Cereal Chemists, 3340 Pilot Knob Road St. Paul, MN 55121-2097, United States of America. Pages: 348 Price: $119

Throughout history, bubbles have been integral to the creation of the finest foods and beverages. Staples such as bread, ice cream, breakfast cereal, cheese and beer are shaped by this traditionally underappreciated and understudied ingredient. Bubbles in Food is the proceedings of the international conference of the same name held in Manchester, UK in June 1998. The goal of the conference was to bring together a multidisciplinary group of food industry professionals and academics to consider the issues surrounding bubble research and applications.

SHELF LIFE EVALUATION OF FOODS edited by C.M.D. Man, Food Science Division, South Bank University, UK and A.A. Jones, Rayner & Co. Published by CTI Publications, Inc., 2 Oakway Road, Timonium, MD 21093-4247, USA. Pages: 336. Price: $177.00 - Shipped Via Airmail

This very important book summarizes concisely and authoritatively information on the shelf life evaluation of foods. The first part of the book covers basic principles, while the remaining chapters cover specific commodities and product groups.

Contents: Part I – The Principles; Scientific Principles of Shelf Life Evaluation, The Methodology of Shelf Life Evaluation, The Principles and Practice of Shelf Life Prediction for Microorganisms, Packaging and Food Quality, Preservation Technology and Shelf Life of Fish and Fish products. **Part II – The Practice;** Delicatessen Salads and Chilled Prepared Fruit and Vegetable products, Chilled Yogurt and other Dairy Desserts, Modified-atmosphere-packed Ready-to-cook and Ready-to-eat Meat Products, Ambient Packaged Cakes, Potato Crisps and Savory Snacks, Chocolate Confectionary, Ready-to-eat Breakfast Cereals, The Storage of Thermally Processed Foods in Containers other than Cans, Ambient stable Sauces and Pickles, Frozen Foods.

FOOD PRESERVATION BY MOISTURE CONTROL FUNDAMENTALS AND APPLICATIONS editors: G.V. Barbosa-Canovas, Washington State Univ.; J. Welti-Chanes, Universidad de las Americas, Mexico. Published by CTI Publications, Inc., 2 Oakway Road, Timonium, MD 21093-4247, USA. Pages: 880 Price: $191.00 - Shipped Via Airmail

The 38 reports in this recent volume examine the effects and uses of moisture in the preparation, processing, preservation, stability, analysis and packaging of food. The authors are food scientists from the Americas and Europe.

Contents: Fundamentals of water in foods: Basic Physical Aspects of Glass Transition • Polymer Science Approach to Water Relationships in Foods • New Techniques to Characterize Water in Foods • Engineering and Technological Aspects of Osmotic Dehydration of Foods: Mass-Transfer during Osmotic Dehydration at the Cellular Level • An Update on Vacuum Osmotic Dehydration • Hurdle Technology in Food: Use of Hurdle Technology in Food Processing • Recent Advances: Homeostatic Mechanisms during Food Preservation by Combined Methods • Critical Review on Intermediate Moisture Fruits and Vegetables • Minimally Processed Fruits by Combined Methods • Microbiological Aspects of Food Preservation by Moisture Control: Combinations of factors to obtain the Microbiological safety of Foods • Physical and Chemical Changes of Dehydrated, Intermediate and High Moisture Content Foods During Processing and Storage: Impact of Drying on Biological Product Quality • Mechanical Changes in Foods at their glass transition region • Advances in Minimally processed food packaging: Modified Atmospheric Packaging for Minimally Processed Foods • Use of Films as Suitable Packaging materials for minimally processed foods.

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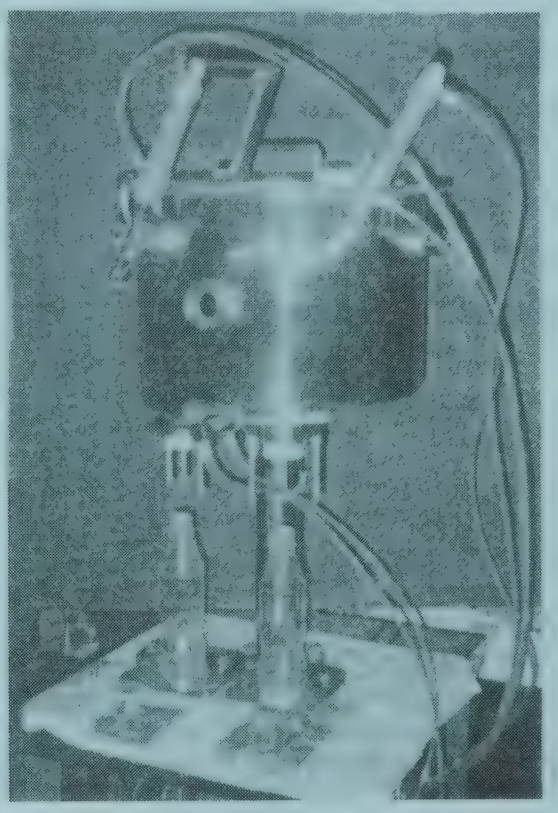

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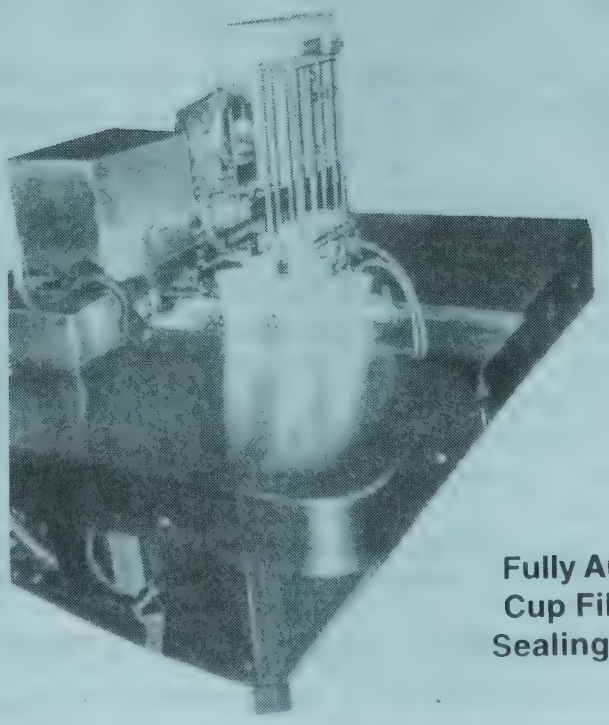

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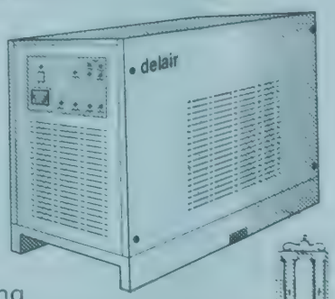

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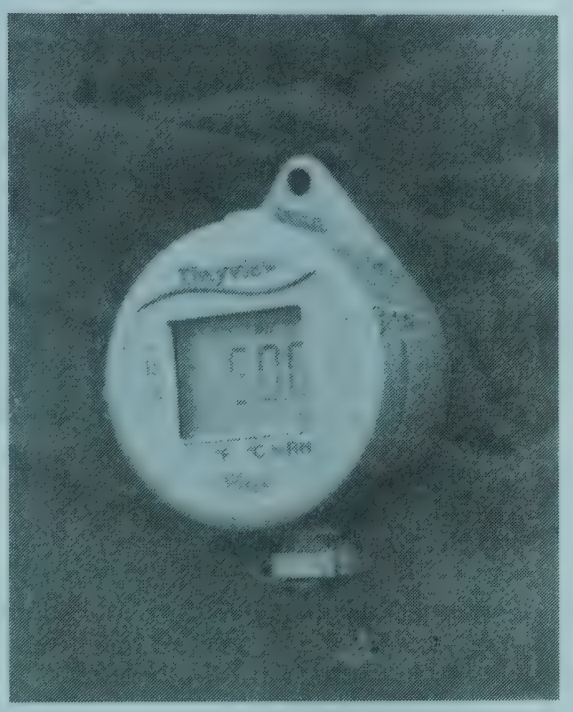

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The Panels are of Density 40kg/M^3 and of overall Thermal Conductivity values ranging from 0.35^0 C for 60mm to 0.12 W/M^2 ^{0}C for 200mm.

The Polyurethane is sandwiched between two sheets of 0.6mm thickness precoated GI sheets, Alternatively SS 304 coverings are also available. The fixing is by Cam Lock arrangements embedded in the Polyurethane.

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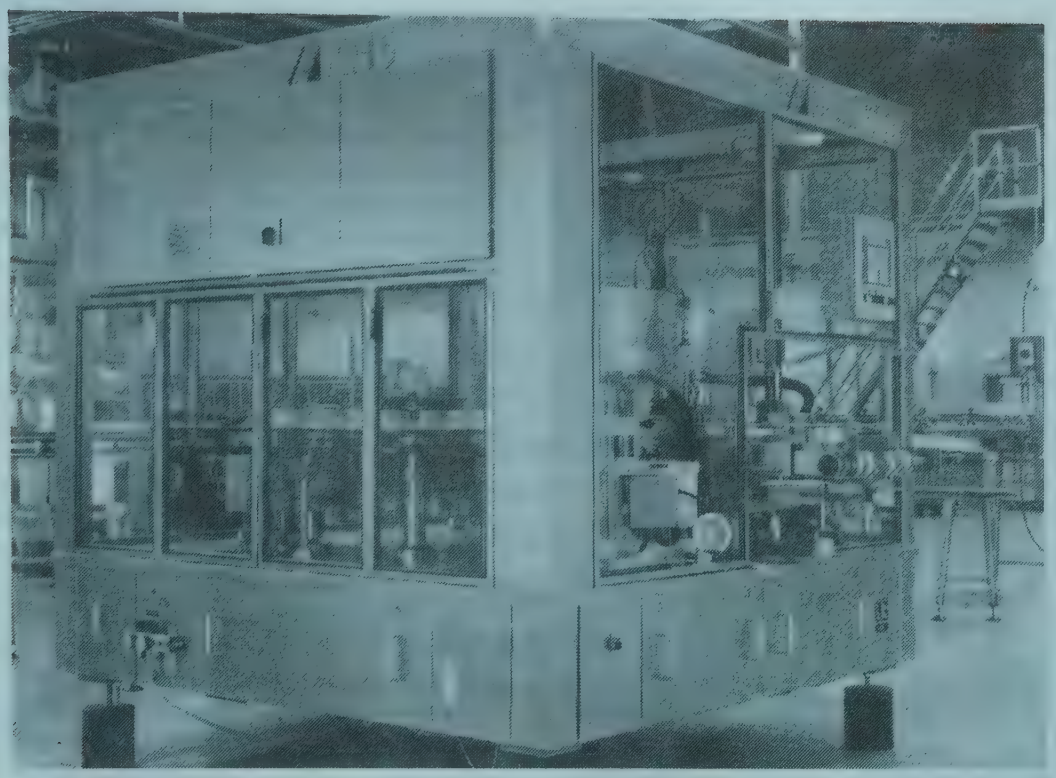
LABELLING TECHNOLOGY



KHS Anker offers two new developments in the field of labelling technology. **The Roland HS** is the new generation of hot-melt labellers for labelling increasingly popular non-returnable PET bottles and at the same time, capable of processing all conceivable shapes and types of packagings. Whether cans, jars, cylindrical or contour containers, the range of container types is virtually unlimited. The design of the Innoket Roland HS fulfils central customers demands for fast format part changeover. All format parts within the labeller can be replaced by means of quick-change devices without tools. KHS Anker is purposely relying on the glue drum system of glue application to ensure reliable continuous machine operation and high machine utilization. The label magazine has been designed down to the last detail. The height and width adjustable magazine makes it possible to use the same magazine for various label sizes.

The Innoket Roland HS is available in seven different sizes with capacities ranging from 4,000 to 45,000 bottles per hour.

The Innoket Variant RF — an inline, rollfeed technology labeller is designed to apply foil labels to round containers up to 15,000 bottles per hour. A special feature of this new development is the VCD system that cuts foil directly on the vacuum drum thus making a separate cutting drum unnecessary. Another major advantage: Fewer format parts. Due to the modest amount of required space, the Innoket Variant RF is suitable for optimum integration in existing filling lines.

For further details, contact:

KHS Maschinen -und Anlagenbau Aktiengesellschaft
Juchostrße 20, D-44143
Dortmund, Germany
Tel: ++49 231 569 1339
Fax: ++49 231 569 1226
Email: rueckstein.manfred@do.khs-ag.com

SURFACE WATER TREATMENT

Surface water treatment is nowadays becoming more and more important as a substitution for ground/well water treatment for industrial/potable water production.

Hydro Air Research is proposing a surface water treatment system based on membrane separation technology, showing several advantages in comparison with the traditional techniques. The conventional surface water treatment consists of a multi-step process, made up by the combination of screen-filtration, ozonisation, coagulation and flocculation, sedimentation, sand filtration and disinfection.

This combination of different processes, the dependency on chemicals to be closed and following steps of contaminants removal involve high maintenance and operating costs. It is evident that the complexity of the system makes it difficult to quickly optimize the performance. Moreover, the partial effectiveness of flocculation and sand filtration as regards the removal of microorganisms, imposes the realization of a heavy disinfection step, though it is uncertain whether pathogens, such as cryptosporidium will be removed.

Further complication of the conventional treatment are the formation, during coagulation or flocculation, of a chemical-rich sludge to be treated and disposed and the high wastage of water for sand filters backwashing. These considerations are an explanation for increased interest in membrane separation technology for surface water treatment.

The advantages of HAR's MEMBRAPURE ™ process can be briefly summarized as follows: • maximized permeate water quality, independent of raw water quality • Compact construction, modular, thus extremely flexible • Very low chemical dosage and energy consumption • Extremely reduced demand for disinfectants thanks to the sieve effect through the membrane physical barrier resulting in very high removal rates of all pathogens.

MEMBRAPURE™ is very effective against the possibility of contamination from pathogen microorganism, bacteria and viruses, providing a process able to combat the health hazard posed by contaminated feed waters.

The growing number of companies adopting a policy of zero discharge and water recycling represents another potential application of MEMBRAPURE™ system for water treatment.

For example, the backwash water for sand filters is now recycled at the top of the water treatment and reprocessed. But the tendency of water to be contaminated, especially by cryptos-poridial oocysts, led the Drinking water inspectorate to recommend a filtering step before recycling of water. The application of MEMBRAPURE™ system guarantees the removal of such contaminants, the reduction of turbidity and residual chemicals, and the removal of particulates from the recycled sand filter water.

MEMBRAPURE™ system can be also used as a pretreatment for reverse osmosis plants strongly reducing the potential fouling by particulates.

Hydro Air Research MEMBRAPURE™ system is an ultrafiltration system based on an UF selected membranes, stable against biodegradation and, due to its very high hydrophilicity, with no fouling tendency.

In the light of the above specifications MEMBRAPURE™ applied to the treatment of surface water can be described through 4 characteristics: • High performance • Good reliability • Low costs • Interesting environmental benefits.

For further details, contact:

Hydro Air Research (India) Pvt. Ltd.
203 Malwa Patanwala Estate
L.B.S. Marg
Ghatkopar (West)
Mumbai 400 086
Tel: 5003400, 5000344, 5000178
Fax: 91-22-5001358
Email: har@vsnl.com
Website: www.hydair.com

FOOD GUMS

From the renowned company, Alok Chem Corporation comes Gum Algel, a wonderful Stabiliser/Thickner/Binder.

Gum Algel finds application in various food products:

- As an Emulsifier-cum-Stabilizer for Ice Cream, Dairy and Non-Dairy Food Products.
- As a Stabilizer cum Thickner for Sauces, Soups and Canned Convenience Foods
- As Bread Improvers for Bakery Products
- As a very special quality product for melted Cheese, Cheese Spreads, Soft Cheese
- For Jams and Jellies, RTS Beverages and other food applications.

Alok Chem Corporation also supplies other Gums such as Gum Guar, Gum Karaya, Gum Tragacanth, Gum Ghatti, Gum Ester. Besides these, Sodium Alginate, Gum Xanthan, Locust Bean Gum and Gum Carrageenan are also supplied.

Gum Arabic/Acacia in Spray Dried form for food as well as pharmaceuticals are also available.

For your requirements, contact:

Alok Chem Corproation
405, Goradia House,
100/104 Kazi Sayed Street
P.O. Box 13048
Mumbai - 400 003
Tel: 3426390/5365/3415668
Fax: 91-22-341 5668

CONVEYOR SYSTEM

Today in business, everyone is looking for saving production time, saving manpower and precious space. Microcraft is engaged in the development of material handling systems which will meet the best need of the customer. Latest development in this field is the inclined Bucket Belt Elevator. Conventional troughed conveyors require low angles of incline to move bulk materials 10^0 to 18^0 maximum, depending on the type of material being conveyed Microcraft Inclined Conveyors elevate materials quickly at angles upto 90^0, requiring approximately half the space and 1/3 the moving parts of the conventional troughing conveyors, thus less operating maintenance costs. Example: A 45^0 Microcraft Inclined Conveyor systems requires only 40% of the structure and 30% of the space used with a conventional system. Plus the conveyor belt is non metallic which cuts down regular maintenance and oiling, giving noiseless operation for years. It is available in PVC or Rubber in food grade material and has a very wide range heat resistance temperature to meet the best needs. The flexible side wall restricts the material from spilling. The entire system can also be made portable to suit different heights at different angles.

They also undertake turnkey projects. The company also manufactures Flat Belt Conveyors, Screw Conveyors, Bucket Elevators, Slat Conveyors, Chain Belt Conveyors, Portables and Stackers.

For further details, contact:

Mr. Michael Moraes (Prop.)
Microcraft Engineering Works
22/23 Paras Industrial Estate
Opp. Bank of Baroda
Navghar, Vasai (E)
Dist. Thane Pin- 401 201
Email: microcraftengg@hotmail.com

LIQUID FILLING MACHINES

"SPECTRA" Liquid Filling Machines are preferred machines for filling various liquids such as Medicines, Syrups, Blue, Ink, Gum, Oil, etc. and are used in pharmaceutical, food, beverages, chemical and other industries.

These machines are known for their accuracy, smooth controls, ease of operation and low maintenance. The Company offers a wide range of choice to the customer as these are available as automatic and semi-automatic, GMP and standard, standing as well as table models as per the requirements. Possible fill volumes are ranging from 1ml. onwards. The company also manufactures machines tailormade for specific applications.

For further details, contact:

Spectrum Enterprises
Gokhale Industrial Compd.
Dr. Raghuveer Nagar
Dombivli (E) 421 201
Distt. Thane
Tel: 0251-453845/443639
Fax: 0251-456489
Email: spectrum7@vsnl.com

FOOD CHEMICALS

Uma Brothers, the renowned company was established in 1975 and right from the inception of the company, they are supplying various chemicals to actual users and consumers covering a wide range of industries.

They supply Indian and Imported Food Chemicals, Antioxidants, Aromatic Chemicals, Amino Acids, Bread Improvers, Bakery Chemicals, Confectionery Chemicals, Dairy Chemicals, Defoamers, Dough Improvers, Dietary Chemicals, Emulsifiers and Stabilizers, Enzymes, Essential Oils, Edible Gum, Fatty Acids, Food Additives & Preservatives, Herbal Chemicals, Minerals, Nutrients, Vitamins (all types), Bulk Drugs & its intermediates, Fine Chemicals, Excipients etc. which find application in major industries like pharmaceutical, bulk drug, food, beverage, beer and alcohol etc.

For your requirements, please contact:

Uma Brothers
C-110, Bhaveshwar Plaza,
189, L.B.S. Marg
Ghatkopar (W), Mumbai - 400 086
Phone: 5004579-5004510.
Fax: 091-22-5000015.
Email: umabroth@bom5.vsnl.net.in

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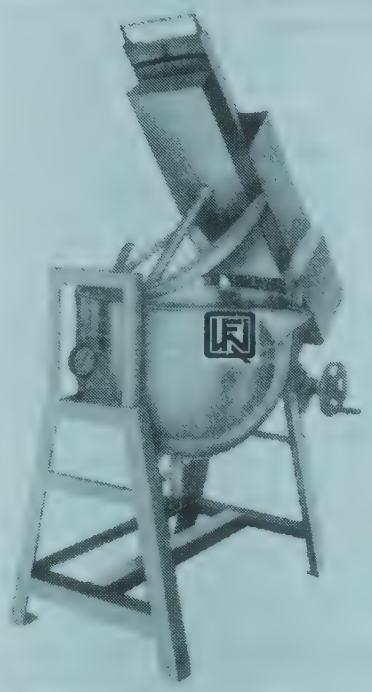

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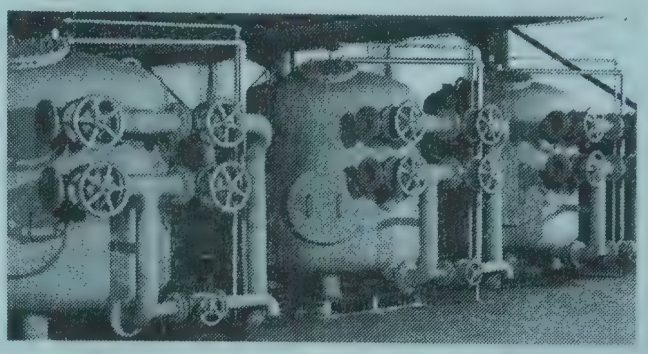

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Ahmedabad : A1/1, Chinubhai Towers, Above IOB, Opp. Handloom House, Ashram Road, Ahmedabad - 380009.
Telefax: 079 - 658 00 47, 079 - 658 40 69
Email: filsep@ad1.vsnl.net.in, Website: www.aquafilsep. com

AUTOMATIC IN-LINE VOLUMETRIC LIQUID FILLING MACHINES

FEATURES:

VERSATILE

Minimal adjustment required to set different capacities from 0.25 to 5 litres with varying container-contours. The entire range can be set on the same machine without any change parts.

DRIP-FREE

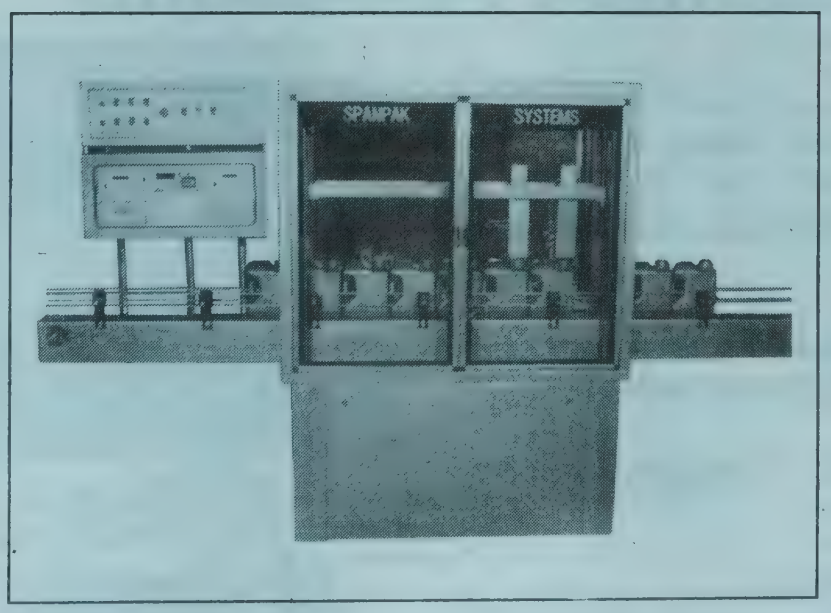
Absolutely "drip-free" deliveries through specially designed nozzles. Ensures rapid recycling of sequence. Nozzles may be fixed or diving type.

ACCURATE

Sustained accuracy of filling since positive displacement hydraulic devices and fast responding electronic circuits are used. Repeat accuracy better than + 0.25% to + 0.5% depending on the volume of liquid of to be filled.

SAFETY DEVICE

Non-contact electronic sensors assure "no bottle no fill" status to avoid spillage in absence of container.



ELECTRONIC CONTROLS

Unique facility to fine calibrate volumes between 250 ml and 5 litres in increments of 1 ml through each nozzle instantaneously by facia mounted "Tactile keypad". Adjustments may be achieved without interrupting filling sequence. This makes the machine totally flexible, universal and "filler friendly" (Optional: Programmeable Logic Control)

STANDARD ACCESSORIES

All machines shall be equipped with separate pump and motor set to interface with customer's storage / buffer tank and filling machine inlet. An 8 foot long motorised conveyor shall be supplied as standard equipment to all automatic models. Electrical cabinet with need based switchgear shall also be provided for incoming 3 phase mains supply.

Semi automatic machines with similar features also available

Manufactured, Sold and Serviced by:

SPANPAK SYSTEMS

B-136, Ghatkopar Industrial Estate, Off. L.B.S. Marg, Ghatkopar (W), Mumbai 400 086
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please contact

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- Airports / Railway Stations
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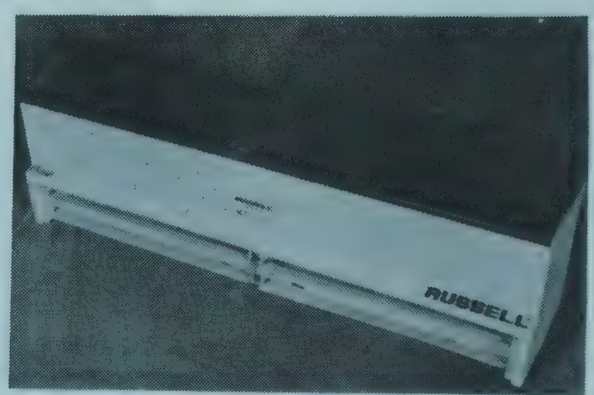

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Santacruz (West), Mumbai 400054
Tel: 6055029/6055099/6058001
Fax: 6055027 • Email: russellindia@vsnl.com

SPRAY DRIED GUM ARABIC

Drytech Process (I) Pvt. Ltd, is a One Stop Shop for various kinds of Spray Dried Food Powders, be it Gum Arabic, Fruit Vegetable, Spice Blends or Caramel. The Company has extended its business horizon from manufacturing of Spray Dried Gum Arabic/Gum Acacia to Fruit and Vegetable Powders including Encapsulated Spice Oleoresins and Caramel Powder. Product ranges includes Gum Arabic (ARAGUM) and Food Powders.

In their fruit powder range are tomato, orange, lime, mango, banana, papaya etc. The encapsulated oleoresin powder range consists of black pepper, capsicum, ginger, garlic, cardamon, paprika etc. In the fat based powder range are groundnut, sunflower, soya, ghee, and sodium and calcium caseinate in caseinate powder range.

To fulfil your diverse requirements, Drytech Processes (I) Pvt. Ltd. manufacture ready-to-use Gum Arabic. Spray Dried Gum Arabic is pure, free from impurities with uniform quality and viscosity. It is free flowing, with low moisture content thus ensuring longer shelf life. It saves on processing time, and cuts power and labour cost.

The unique properties of Spray dried Gum Arabic include emulsifying, stabilising, coating, binding and encapsulating. With the added advantages of adhesivity and calorie control, Gum Arabic is widely used in the manufacture of food flavours, soft drink, confectionery, chewing gum, coated nuts, bakery icing, syrups, diabetic and dietetic foods, asafoetida, medicinal tablets etc.

For your requirements, write to:

Drytech Processes (I) Pvt. Ltd.
B-16 Girikunj Industrial Estate,
Mahakali Caves Road
Andheri (E),Mumbai 400 093
Tel: 8378915, 8326494,8301918, 8210401
Fax: 022-8242476, 8367442
Email: drytech@bom8.vsnl.net.in
Visit us at: www.drytechindia.com

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'LINCON' Heavy Duty Mixer Grinder is SIX times bigger than any domestic mixer grinder available in the Indian market. It has 6 litres capacity Stainless Steel Jar, 1 Hp, 1Ph, Electric Motor in aluminium cast body and also available in 2Hp, 3Ph, Electric Motor. LINCON Heavy Duty Mixer Grinder has been found extremely useful for Research & Development Laboratories of various chemical units and also for handling medium size lots in regular production. It has a detachable lid, continuous rating with an MCB Switch to prevent overloading. It carries 1 year warranty against manufacturing defects. Usetul for Food Processors, Caterers, Restaurants, Industrial Canteens and Housewives.

For further details, contact:

The New India Electric & Trading Co.
Hamam House
38 Ambalal Doshi Marg
Fort, Mumbai 400001
Tel: 2651177, 2651597
Telefax: 2651597
Email: neitco@hotmail.com

ASAFOETIDA (HING)

Hing (Asafoetida) is one of the spices used in cooking and is used in papads, pickle, dals, vegetables. Its very smell wafts through the kitchen.

Laljee Godhoo & Co. manufactures L.G. Brand Compounded Asafoetida (Bandhani Hing). The company has been catering to the flavour needs of housewives and hotels throughout India for over 100 years. L. G. is known for quality. The product is hygienically prepared and tested and is popular all over India and in foreign countries. Their product is exported to Far East/Middle East/ U.S.A./U.K.

The secret of south Indian Food is L.G. compounded Asafoetida. No meal is complete without it.

Export Office and Hotels enquiries are solicited.

For more details, contact:

Laljee Godhoo & Co
213, Samuel Street
Mumbai - 400 003
Tel: 91-22-3421379/3445812
Fax: 91-22-3401742
Email: lgco@bom3vsnl.net.in

FOOD PROCESSING MACHINERY

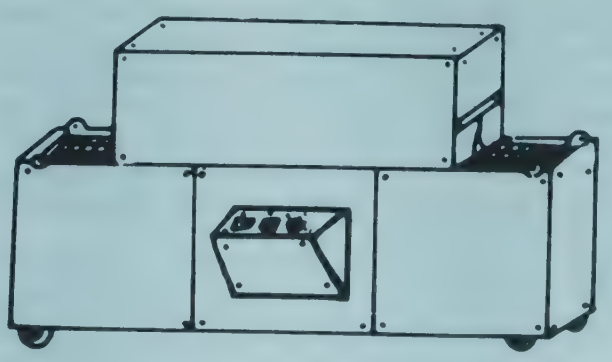
Hari Om Industries are manufacturers of various machines that are used in the food processing Industry.

Among the machines manufactured by them are Potato Wafer Plant, Banana Wafer Machine, Dry Fruit-cufting/ Powdering Machine.

For further details, contact:

Hari Om Industries
Dhebar Road (South)
Atika Industrial Area
St-3 Near Jaydev Foundry
Rajkot 360 002
Tel: (R) 363620, 371438
Fax: 0281-271745
Email: hariomind@epatra.com

DRYING MACHINE K-205



Kapoor International are manufacturers of Drying Machines. Model K-205 incorporates a conveyor for efficient loading and transporting of products which are required to be dried. When the products are placed on the conveyor, they are carried into the tunnel. The tunnel is fitted with heaters and hot air circulates in the area which provides rapid heat transfer. The machine is fitted with an electronic controller with a range up to 250°C. The speed of the conveyor can be controlled by an electronic thyrostat controller. It finds applications in chemical, pharmaceutical, leather and plastic industries.

For further details, contact:

Kapoor International
22,23 Vishnu Indl. Estate
Masrani Lane, Halav Pool
Kurla (West)
Mumbai 400 070
Tel: 5142594, 5168891
Fax: 6501878
Email: shrinkwr@bom5.vsnl.net.in

COLOUR SORTING MACHINES

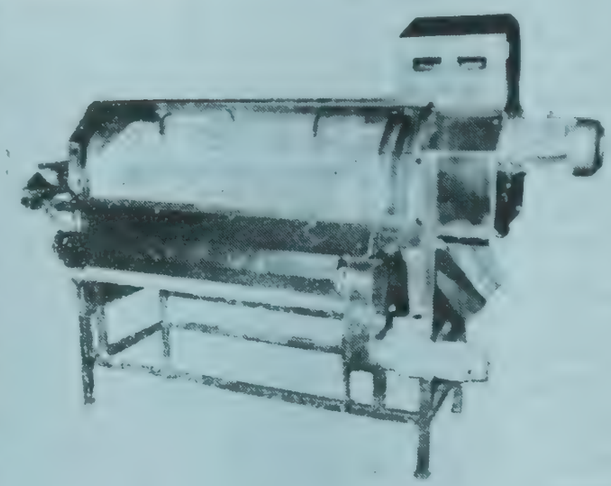
Delta Technology Corporation, USA have been in the colour sorting market for over 20 years. Their Waterfall series are the latest 'state-of-the-art, new generation colour sorting machines that are designed to cater to the high capacity requirements of modern day business trends. To achieve this at the lowest cost per kg of product sorted, these machines are designed with the latest 'fuzzy logic', for the ejection system where the first pass accepts is baggable and where the rejects of the first pass, which can be designed mechanically at an extra cost, be re-passed on a separate tray simultaneously in such a way that there are just two baggable outputs from the machine - the pure accepts and the pure rejects. The overall mechanics are drastically reduced and with it also its cost. The cost of labour is further reduced if a simple bagging system is installed using a minimum size conveyor belt and an elevator. Water fall machines use the latest real time scanning colourmetric optical system where any colour, even a spot can be detected and sorted

The Waterfall models are presently available from 1.5T per hour to 7T per hour for coffee, rice, seeds, pulses, nuts and many other products. Capacities are based on type of product and contamination levels.

For further details, contact:

Bansal Flour Mill Engineers
4/5, B, Asaf Ali Road
New Delhi 110002
Tel: 3250022-23, 3264041, 3286343
Fax: 3266171, 3285749
Email: bansal@del3.vsnl.net.in

FRUIT/VEGETABLE PROCESSING & PACKAGING MACHINERY



Pea Podder

Jwala Engineering Company provides the complete solution for processing and packaging of fruit and vegetables. Their range of machinery includes fruit/vegetable preparatory, processing and canning equipment, fruit juice concentration equipment, mushroom processing and canning line, potato chips line. Their packaging machinery includes automatic filling line and other packaging machines. They also manufacture bottling line.

Their activities include manufacture and supply of complete plant on turnkey basis and individual equipment for expansion/ modernisation. They also provide consultancy for setting up a complete new plant, and overcoming existing problems.

They have a strong team of engineers, food technologists, design engineers with experience of more than 15 to 20 years in the field.

Jwala Engineering Company has introduced the Large Pea Podder in its preparatory processing line.

The Pea Podder is suitable for depodding of peas in pods. The unit is complete with beater fitted with blades, feed hopper, discharge chute, riddle mat made out of FDA quality belt, flanged motor with shear pin arrangement etc.

The unit is also complete with an apron conveyor with geared motor with shear pin arrangement for removing the waste peel. Capacity: upto 1000 kgs of Pea Pods/Hr.

Special Features: * The body of the unit is made out of S.S. * The beater and blades are also made out of S.S. * All the covers & guards are made out of S.S. * The motors are provided with shear pin arrangement for the safety of equipment. * The front covers can be provided either of acrylic (transparent) or of S.S. * The drive is easily openable and hence better for maintenance.

For further details, contact:

Jwala Engineering Company
12, Surve Industrial Estate
Sonawala Cross Road No.1
Goregaon (East), Mumbai 400 063
Tel: 8740279, 6903038
Telefax: 8768768

AIR CURTAINS

Russell Air-Curtains marketed by Donromos Pvt. Ltd., create an uniform formidable barrier of air stream at an opening against heat, dust, smoke, odour and insects, without hindering the movement of people and merchandise in and out of the area.

Manufactured by maintaining strict quality control right from procurement of raw materials to the final assembly line, the product undergoes mandatory rigid tests before it leaves factory premises. The radial flow configuration attained with specially designed body and impellers along with power efficient motors ensures air displacement at minimum noise levels. Its aesthetic elegance and sleekness matches all interiors and is available in Horizontal, Vertical and Portable models in powder coated and stainless steel bodies for commercial and industrial places.

For further details, contact:

Donromos Pvt. Ltd
Russell House, 74, 2nd Hasnabad Lane,
Opp. Willingdon Gym.,
Santacruz (W), Mumbai 400 054
Tel: 605 5028/6497615, Fax: 605 5027
Email: russell@bom5.vsnl.net.in

DIETARY FIBRE CONCENTRATES

Clarico-FPC (India) are the marketing agents of J. Rettenmaier & Sohne, GmbH & Co., Germany for their various range of natural food ingredients widely used in processed food industry. J. Rettenmaier are the worlds leader in insoluble dietary fibres. Their brand name is VITACEL.

Vitacel wheat fibres are neutral in taste, odourless and have excellent water retention capacity. The fibres hold water by capillary effect and the release is slow. As the water is in the form of bound moisture, so no microbial growth. Vitacel is temperature resistant and does not undergo changes in oleic and alkaline solutions.

Vitacel Wheat Fibres finds application in baked goods, processed meat, snacks by keeping the product fresh for a longer time and also increasing yield and also reducing fat consumption.

A special grade of Vitacel Wheat Fibre also has the property of natural anti-caking agents. It can be used in Savoury flavours and dry blends for this property. The other advantage is the excellent flavour retention capacity of Wheat Fibre.

Apple and Orange Fibre finds usage in Nutraceuticals, dietary drinks and specialized bakery preparations. The soluble fibre content in these fibres are more than wheat fibres and as such more therapeutic benefits in the product.

Tomato Fibre has excellent water retention and very good gelling properties. It can be used in ketchups and purees. In fact, it helps in preventing phase separation.

Vivasoy soy milk powder has excellent usage in Nutraceuticals, high energy foods and coffee creamer. It is by itself a complete food with excellent combination of protein and fats. This product has no sugars and a high content of Poly unsaturated fatty acids. Thus making it an ideal product to be incorporated for Nutraceuticals for therapeutical segments.

For more details, contact:

Clarico-FPC (India) Pvt. Ltd.
601, Gateway Plaza
Hiranandani Gardens, Powai
Mumbai 400076
Tel: 91-22-570441, Fax: 91-22-5704412
Email: info@clarico-fpc.com
Visit us at: www.clarico-fpc.com

CRATES AND CONTAINERS

Prince Multiplast (formerly known as A-1 Plastics) is one of the largest plastics processors in India. They have developed capabilities in manufacturing Injection Moulded Bottle Crates, Material Handling Crates as well as Blow Moulded Packaging Containers.

Prince Multiplast is a ISO 9001 Certified Company by Quality Assurance Services Australia. Some of its customers are Coca Cola, Pepsi and Cadbury for its plastic crates while its blow moulded containers are sold to the likes of Gulf Oil, National Dairy Development Board and Indian Oil Corporation. The company's products are seen virtually in every state of the country.

Continued quality improvement is a way of life at Prince Multiplast from designing development, manufacturing, inspection, testing, production to distribution and customer service. Prince Multiplast has also ensured that product design and manufacturing processes are eco-friendly to avoid wastages.

Prince Crates are injection moulded in high grade plastics. Available in a wide range of design and colours, they are odourless and resistant to acids, alkali solutions in common use and are non-toxic. They can be screen printed and embossed with the customer's name and logo and have excellent stability and stacking capacity. These strong and durable crates are used in variety of industries like Fisheries, Hatcheries, Vanaspati, Edible Oils, Ice Creams, Frozen Desserts, Soft Drinks, Beverages, Breweries, Textiles, Automobiles, Farms (Floriculture, Horticulture or an Orchard). Bakeries and Food Processing Industries, and many more.

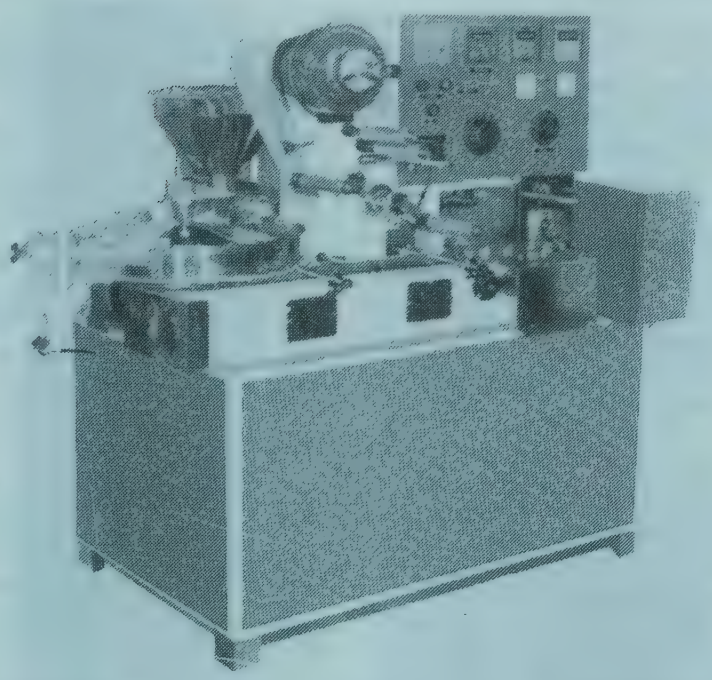
The company produces a wide range of blow moulded articles from 0.5 ltrs. to 30 ltrs., which enables the company to be a one stop shop for its customers who need different sizes of containers. The various functions consisting of product design, development, manufacturing, testing, storing and supply are done under one roof which enhances the co-ordination and quality and hence, better services for valuable customers. The industries which use the company's containers include Edible Oil, Lubricant Oil, Chemicals, Pharmaceuticals and Household Liquids.

The Computer Aided Designing Centre, well equipped Testing Laboratory, modern manufacturing facilities and a team of skilled, dedicated personnel enables the company to satisfy the customer's needs at all times.

For further details, contact:

Prince Multiplast Pvt. Ltd.
Amar House, Plot No.103
Road No.12, Marol MIDC
Andheri (E), Mumbai 400 093
Tel: 91-22-8363600/01/02/03/04
Fax: 91-22-8360404/0088
Email: prince@bom5.vsnl.net.in
Website: www.princemultiplast.com

WRAPPING MACHINE BOIL CANDY HARD



Hard Boiled Candy Pillow Pack Wrapping Machine developed by Bombay Engineering Industries is widely used specially in the field of foodstuff.

This fully automatic machine packs small products into waterproof and airtight single or multiple packs.

Wrapping Material to be used: Printed or unprinted reels with a core bore of 70-75 mm and outer dia. of the reel to be 300-350 mm and heat sealable packing material.

Style of Wrap: Single Pack :- Each article in its own pack, cut-off after each seal or strip pack with perforation after each pack.

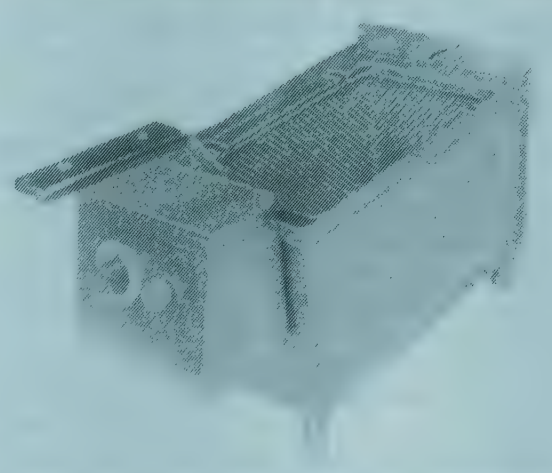
Multiple Pack: Two or five individual units packed in a single pillow.

Salient Features: • Clearly arranged structures of the different units • Extended size range • Simplified and fast exchange parts • Constant heat of sealing rollers • Precise register mark control

For further details, contact:

Bombay Engineering Industry
R.No. 6, (Extn.) Sevanthibai Bhavan
Chimatpada, Marol Naka
Andheri (E)
Mumbai 400 059
Tel: 836 9368, 821 5795 (R): 821 2071
Fax: 836 9368
Email: bommars@bom7.vsnl.net.in
Website: http://bei.jump.business.com

KITCHEN EQUIPMENTS



For over two decade, Sree Annapoorna Kitchen Equipments has been manufacturing & supplying international class stainless steel Kitchen Equipments to leading hotels, industrial/education/religious establishments, hospitals etc.

The high quality of the products is the outcome of Sree Annapoorna's vast experience in the catering field backed by the expertise and dedication of engineering/ erection personnel who can offer first-rate turnkey service to valued customers.

Their products are • Iddli Chamber (Steam) • Steam Cooking Vessels for Rice/ Sambar/Veg. Boiling/Milk Cooking • Cooking Ranges (LPG) for Indian and Continental cooking • Chinese Cooking Ranges (LPG) for Chinese Cooking • Hot/Dosa Plates for Dosa, Chapathi & Parotta • Bain Marie (Hot Case) • Sterilizer • Fryers • Service Counter • Steam Generator • Trolleys • Milk/Coffee/Tea Dispenser • Utility Racks • Dough Kneading Machine • Pounding Machine/Potato Peeler • Cabinets - Hot/Cold • Water Cooler • Washing Sink and • Dairy Equipments such as pasteurizers, ageing vats, buttermilk churner, storage tank, etc.

For further details, contact:

Sree Annapoorna Kitchen Equipments Limited
Sree Annapoorna Farms
Thondamuthur Road, Vedapatti
Coimbatore 641007
Tel: 473469,431022, 431471
Fax: 0422-547322

MOULDED PACKING BOTTLES

B.B. Plastics are manufacturers and suppliers of best quality moulded and injection moulded bottles. The bottles are made from virgin material and designed for packing various products in Food and Beverage Industry, Mineral Water, Fruit Juices, Ayurvedic Medicine, Pharmaceuticals and Cosmetics.

For your requirements, contact:

B.B. Plastics
B-96, Sector -10
Noida 201 301
Tel: 011-91-452509, Mobile: 9810077095

WATER PURIFICATION TECHNOLOGY

Pollucon Enviro Engineers Pvt. Ltd. (PEEPL) manufactures water and waste water treatment systems for business and industries. Commercial/Industrial systems are available with a wide array of options for non-standard applications.

Reliable equipments, turnkey services, build-own-operate.... whatever the project, whatever the application, PEEPL is the single source for all your waste water treatment needs. Nobody offers more technology, more experience, more service, more business options.

From your initial inquiry, the staff of process and design engineers at our office is prepared to offer assistance with process design, equipment selection and sizing, CADD system drawings and customer service.

The company has an impeccable record for service and quality and this is because every query is treated with gravity and seriousness.

The company's service engineers will call upon the customer to obtain first hand information about the process, critical parameters, constraints etc.

Primary Market: * Commercial Complexes Sewage Treatment Plant * Food and Breweries * Pulp and Paper * Pharmaceutical * Textile Industry * Tannery * Distillery * Chemical

Pollucon Enviro Engineers Pvt. Ltd., is an engineering firm and offers various services such as designing, structural designing, construction, fabrication, erection and commissioning of Water, Waste Water and Air Pollution Control Systems.

Company Set Up: Established in 1995 with initial organization set up of three persons with two clients. Today with a good reputation and skill in the technical aspects its total strength is 35 and with about 15 to 16 clients at a time.

Pollucon Enviro Engineers Pvt. Ltd., have installed and successfully commissioned more than 50 Effluent Treatment Plants for various industries.

Their manufacturing activity, is a specialization in itself.

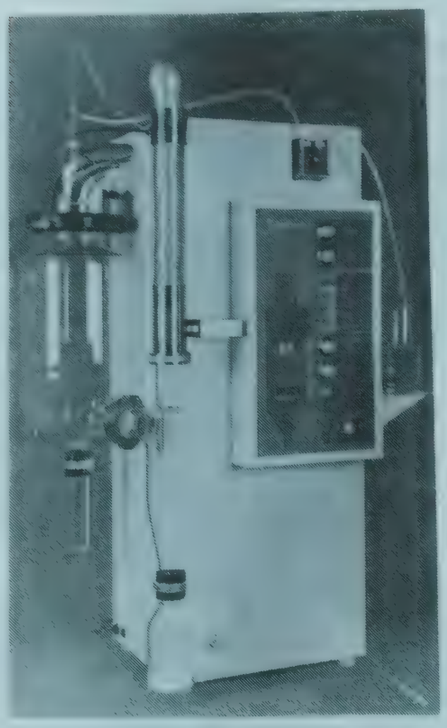
Equipment's Range (A): * Surface Aerators * Clarifiers and Clariflocculators Mechanism * Flash Mixer / Agitators * Flocculators * Filter Press.

Equipment's Range (B): * Pressure Sand Filter * Activated Carbon Filter * Twin Lobe Blower * Dosing Systems * Reverse Osmosis * Softner * U.V. System * D.M. Plant.

For further details, contact:

Pollucon Enviro Engineers Pvt. Ltd.
1-Om Dipti Building
Carter Road No. 7
Borivali (E), Mumbai 400 066
Telefax: 911-22-805 1534, 809 0134
Email: walke@satyam.net.in

LABORATORY SPRAY DRYER SD-05



Hemraj Enterprises offer glass laboratory Spray Dryer SD-05, on behalf of their principals "M/s. Lab-Plant Ltd., U.K." The Spray Dryer is ideally suited for Research and Development purposes and produces free flowing spherical powders from solutions and suspensions. The unit is self-contained, ready for immediate operation and all functions are simple to select and adjust. The SD-05 is extremely compact in its design and is intended for use on a bench top. The SD-05 has successfully processed samples in the following areas: Food & Drink, Ceramics, Pharmaceuticals, Blood, Chemicals, Plastics, Adhesives, Dyestuffs, Flavours & Colourings...

There are more than twenty SD-05 spray dryers already operating all over India for various applications.

Lab-Plant Ltd. also supply various glass Laboratory Process Equipment like distillation, reaction, fermentation, temperature control etc. Pilot Spray Dryer Unit is also available for conducting trials on customers' products.

For further details, contact:

Hemraj Enterprises
227, New Sonal Link Industrial Estate
Bldg. No.2, 2nd Floor, Link Road
Malad (West)
Mumbai 400 064
Tel: 6906095/8627334
Fax: 022-8628727
Email: sales@hemrajindia.com
Website: www.hemrajindia.com

FOOD PRODUCTS

Naram's are pioneers in making of Syrup Crush, Sherbat from kesar, badam, dry black currant, apricot, dry fig, mixed dry fruit, plum-peach, chocolate, kokum, thandai from natural and pure material.

Dr. Vidyutt K. Naram, a B.Sc. with Chemistry, has done Craft Diploma in Bakery and Canning from Dadar Catering College in 1982 and also has a Doctorate in Nature Cure from Delhi. The Nature Cure Federation of India was started by Mahatma Gandhi.

Vidyutt's wife Neela Naram, a B.Sc. DMLT and Cookery expert, looks after production. Syrup, Crush, Sauces and Chutney are manufactured by using quality ingredients. Process parameters are carefully controlled and have desired characteristics, quality, suitability, acceptability by people. She has developed authentic Pani Puri Concentrate, Hot and Sweet Chutney, Amla Spread, Picante (Pizza) Sauce, Ginger Spread and Dessert Sauces etc. A special variety are exported to different countries and are also available at leading Dry Fruit shops in Mumbai, Pune, Gujarat and Hyderabad etc.

This quality products are ideal for Milk Shake, Juice Parlour, Desserts, Sweet meat, Bakeries, Caterers, Ice cream Toppings and for daily use.

Recently they have developed Amla Syrup, Tulsi-Honey, Cola, Chat Chutney and Sugarless Khajoor Pak and Dry Fruit Fudge.

Quality control is a mantra in the organisation. This has been proved beyond doubt that even a small scale unit can give best quality products made from pure ingredients."

For further details, contact:

Naram's Food Products
Post Box No. 7694
Mumbai 400 067
Tel: 887 3328 / 4035
Fax: 898 1317 / 886 1202

LABORATORY INSTRUMENTS/ EQUIPMENT

Lab Instruments supply Laboratory Instruments and equipment for Research Education and various industries. Some of their products are UDV Spectrophotometers, Electronic Balances, Ion Analysers & Electrodes, Tintometers, Viscometers, Refrigerated Centrifuge, pH Meter/Conductivity Meter, BOD Incubators, Polarimeter/Refractometer, Stirrers and Emulsifiers, Heating Mantles, Test Sieves, Filter Paper, etc.

For further details, contact:

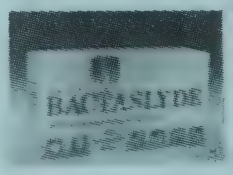
Lab Instruments
78 (B) Jagannath Sankar Seth Road
"Ratnadeep"
Near Roxy, Opera House
Mumbai 400 004
Tel: 3690973,3681316, Fax: 3690973

Did you know
that invisible
Monsters
are **eating** into your
product **quality?**

Yes, Bacteria!

Bacteria cause : • Spoilage of food products, Milk and Dairy produce • Spread of decease through water and food products • Reduction of product quality and shelf life

Now detect Bacteria easily with



BACTASLYDE

Microbiology laboratory not required

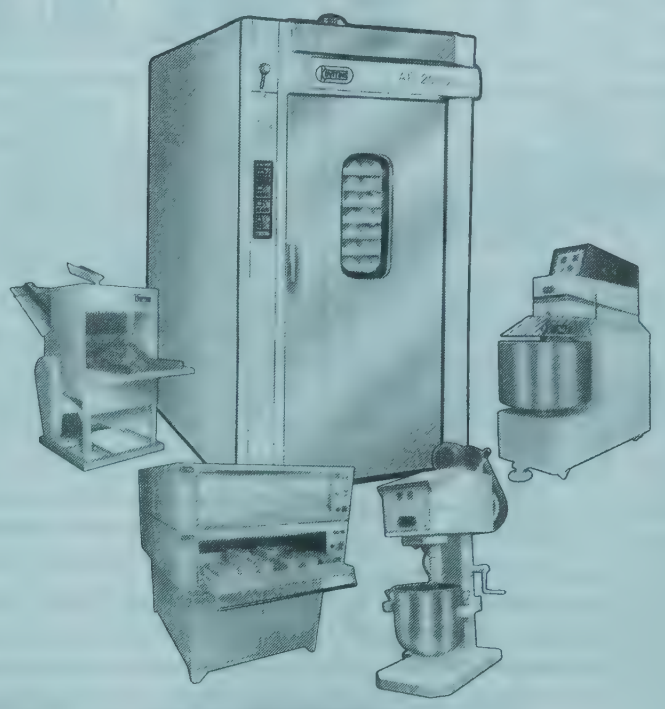
- Can be used by **anybody**
- Extremely easy to use and quick
- No capital investment • Economical
- Can be used at site very effectively.

BACTASLYDE can be used for detecting microbial contamination of all kinds of materials viz, Metal working Fluids, Process waters. Foods, Soft drinks, Paint and Pigments etc.

RAKIRO BIOTECH

1, New Modella Industrial Estate, Padwal Nagar, Wagle Estate, Thane - 400 604
Tel.: +91 (22) 583 6846

Kovitins
Bakery Equipments



Manufactures of :

• Rotary Rack Oven • Modular Deck Oven
• Planetary Cake Mixer • Spiral Dough Kneader
• Gravity Feed Bread Slicer

KOVITINS

21 Nandlal Ramroop Estate, Ramkrishna Mandir Road, Andheri (E), Mumbai 400 059. Tele/Fax: 8230095

DIETARY FIBRE
For FOOD and NUTRACEUTICAL Applications
(J. Rettenmaier & Söhne GmbH, Germany)

PRODUCTS	APPLICATION AREAS	FUNCTIONS / ADVANTAGES
• VITACEL Wheat Fibre • VITACEL Apple Fibre • VITACEL Orange Fibre • VITACEL Tomato Fibre • VITACEL Oat Fibre • VITAPROT Lupine Protein • VIVAPUR Microcrystalline Cellulose • VIVASOY Soy Milk Powder	• Baked Goods (Bread, Cakes, Khari, Toast) • Pasta • Extruded Snacks • Meat Products & Sausages • Grated Cheese • Dry Blends, Spices, Extracts • Potato Products • Savoury Flavours • Traditional Indian Sweets & Namkins • Ethnic Indian Snacks • Ready mixes • Health Foods/Diet Foods • Nutraceuticals	• Improve freshness and increase in shelf life • Increase of dough yield, dough volume • Improve texture • Water binding and retention • Dietary Fibre enrichment • Anti-caking • Improve free-flowing property • Fat Reduction • Improve crispiness • Health benefits • Reduced oil feeling • Reduction in breakages • Smoother surface • Increased Flavour retention

For technical support and ex-stock deliveries, please contact:

CLARICO-FPC (INDIA) PVT. LTD.

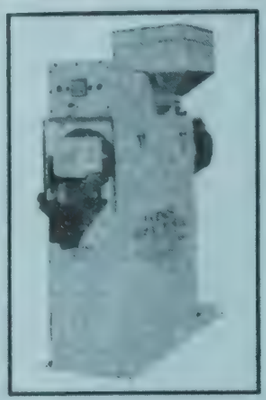
601 Gateway Plaza, Hiranandani Gardens, Powai, Bombay 400 076, India
Phone: +91-22-5704411, Fax: +91-22-5704412, Email: info@clarico-fpc.com

Friends
REGD. TRADE MARK

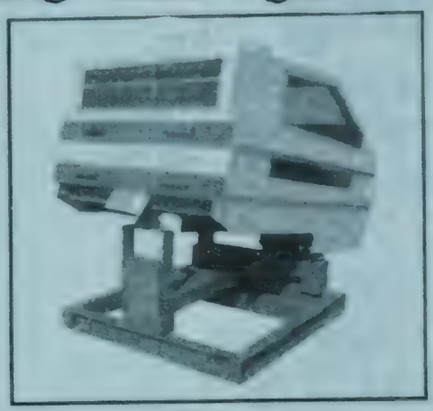
FRIENDS

RICE MACHINERIES

RICE GRADERS



RICE POLISHER (GSM-40)



DE-STONER

RICE POLISHER

Approved by : C.F.T.R.I. Mysore

MANUFACTURERS ERECTORS & ENGINEERS :
Modern Rice Plant, Rice Shining Machine (For Silky Rice), Rice Whitening Machine, Rice Grading Plant, De-Stoner and all Kind of Spare Parts of Rice Processing Machinery.

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Phone : off. : 0183-583542,587943 Telefax : 587944, Mobil : 98140-50146, Cable : 'Silky Rice'
E-mail : sharanji@jla.vsnl.net.in. Web Page : www.rice.ind.net/friends
Delhi Office : 331, Sanjay Enclave, Opp. Karnal Road Depot, Delhi-110033 Ph. : 011-7223343 Mobile : 98112-28612

ONLY PLACE FOR LIQUID BOTTLING MACHINERY

BOTTLE WASHING MACHINE

● Brush type with S.S./ Aluminium tank ● Output : 10,000 / Shift

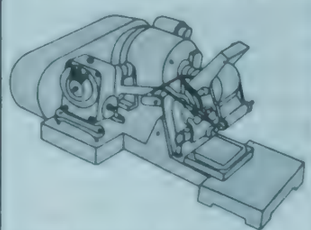
BOTTLE FILLING MACHINE

● 5 ml -1 Litre ● Complete S.S. Body ● Output : 10,000 Bottles/Shift

BOTTLE SEALING MACHINE

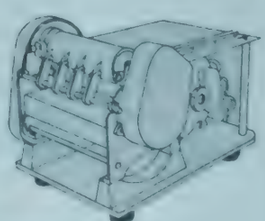
● Hand/Motor Operated
● For 8-35 mm ROPP Caps
● Output: 10,000 / Shift.

BATCH/CODE PRINTING M/C



● Hand Operated /Motorised
● Output 10,000 / Shift

LABEL GUMMING MACHINE



● Motorised
● Output 10,000 / Shift

PACKING CONVEYER M/C

● 8-10-12-16 Ft.
● With Sunmica/S.S. Top
● Speed as per requirement.

APPLICATIONS :

- Syrups
- Squash
- Sauce
- Vinegar
- Liquors
- Oils
- Cosmetics etc.

OTHER PRODUCTS:

- Filteration Unit
- Stirrer
- Storage Tank
- Transfer Pump
- Powder Processing Machinery

PHARMACO MACHINES
B- 2/17, Anubandha, Next to Ramkrishna Math, Sinhagad Road, Pune 411030
Tel/Fax: 020-4220248 • Email: saumitra_65@hotmail.com

LOBE PUMP

Jyoti Engineers introduce a new hygienic Twin & Trilobe Pump series which are suitable for the products handled in Food, Canning, Confectionery, Cosmetics, Beverage, Brewery, Bakery, Dairy, Pharmaceutical & Chemicals process industries. This new pump works in rotation of the lobe rotor, creates a vacuum, the volume increases, causing the liquid to flow into the pump chamber. The liquid is carried between the lobes and the pump casing. Thereafter the other lobe chamber is filled with the liquid and lastly the liquid is pressed out of the pump. The improved design ensures precise timing and avoids contact between lobes. It is suitable for slury, sticky with viscosity fluids. The casing cover can easily be removed for cleaning and inspection.

When pumping products with a high temperature a steam jacketed cover can be fitted to transfer heat to pumping body to minimize set-up of fluids and to maintain product temperature during extended shut down periods. The ports are designed in bevel seat, conforming to ISO standard and shaft sealing by mechanical seal. It is also available or obtainable with stuffing box gland packing or an 'O' ring seal.

The pump is delivered fitted on portable trolley stand with suitable electric motor and starter for easy movement in plant to connect for ultimate use with other units.

Available in standard part sizes from 25mm to 100mm having capacity from 45L/h to 22,000 L/h.

For further details, contact:

Jyoti Engineers
5, Akshar Dham
Narayan Nagar, L.B.S. Marg
Ghatkopar (W), Mumbai 400086
Tel: 5127568/5158612
Fax: 022-5164376
Email: rajengg@bom5.vsnl.net.in

SLUSH ICE MACHINES

Premier was founded in 1988 concentrating on the Development, Production and Marketing of Industrial / Commercial Refrigeration Systems in India. Today the company is a leading manufacturer of industrial chilling systems, known for setting standards in an otherwise disorganised sector.

Premier has three different divisions to take care of customer interests: • Industrial Process Division • Commercial Equipment Division • Food Refrigeration Division.

Premier has a global outlook and keeping this in vision, we have Business association with some of the international companies • **Truchill** – Premier Make Air/Water/Brine cooled packaged water chillers • **Technoblock** – Italy make Cold Room Units • **Staff** – Italy make Flake Ice Machines, Ice cube machines, Ice Cream Machines • **Staff** – Italy make Cold Drink Dispensers, Slush Ice Machines • **Universal** – Italy make Softy Ice Cream Machines • **Furong Shanghai Equipment Co** – Shanghai – Refrigerated Display cabinets

Staff Ice Systems – Italy, a pioneer in commercial Ice Systems and has been designing and producing Ice machines for over four decades. These machines have been steadily evolving in state of the art engineering and design over the years. Continuous innovation and stringent quality assurance now makes Staff Ice machines better than ever. They represent today's best value in Ice making equipment and accessories.

The Premier Staff Slush Ice Machines are one of the best Ice Machines available in India. There are different models. These machines are completely automatic and easy to operate. The Machines are well suited for Indian conditions. They are made in Italy with state of the art technology and are 100% imported units directly from Italy. Continuous innovation and stringent quality assurance now makes Staff Ice Machines better than ever.

The specific features of Premier Staff Slush Ice Machines are: • They are available in three different models

i) Single Tank Capacity 14 Liters – One Flavor can be stored ii) Double Tank Capacity 28 Liters – Two Flavors can be stored iii) Three tank capacity 42 Liters – Three Flavors can be stored.

• Independent Functioning of each plant with a reduction in the consumption electricity during the periods of minor demand of slush ice • Partial production guarantee of Slush Ice in the case of system failure • Air or Water cooling • Interchangeable spare parts • No limestone problems

For further details, contact:

Vasu Dev Rao
Premier Refrigeration Ltd.
Commercial Refrigeration Division
1 & 2, Akurli Ind. Estate, Akurli Road,
Kandivli (E)
Mumbai 400101
Tel: 887 0304, Fax: 884 1275

WASTE WATER TREATMENT

Aqua Filsep Inc. committed to Water and Waste Water Treatment, have considerable experience in providing to the industry, solutions to water and waste water treatment. Consequently, the company has developed expertise in process equipment, control design, and construction of custom-engineered systems for a wide range of applications, with active support of their associates, Osmonics Corporation, USA and Aquafine Inc., USA.

The various products that **Aqua Filsep** offers are * Water and Waste Water Treatment Plants * Reverse Osmosis Plants, * Demineralisation Plants * Water Softening Plants * Sand Filters and Activated Charcoal Filters * Chemical Dosing Units* Mineral Water Plants * Swimming Pool Water Purification Systems * Waste Water/Effluent Treatment Plants * Clariflocculators, Clarifiers, Aerators. Water and Fuel Treatment Chemicals (For Boiler and Cooling Water Systems):

1. Corrosion Inhibitor 2. Scale Inhibitors 3. Oxygen Scavengers 4. pH Boosters 5. Fuel Additives & Combustion Catalysts.

Other Related Products, Spares and Components include: * Membranes, Resins * High Pressure Pumps, Pressure Boosting Systems * Pressure Vessels * Storage tanks for special purpose etc.

The services that the company offers include: After-Sales Services & Annual Service Contract * Modification/ Automisation of existing Water & Waste Water systems etc.

For more details, contact:

Aqua Filsep Inc.
7 Retiwala Indl. Estate
H.A. Palav Marg, Byculla (East)
Mumbai 400 027
Tel: (O) 3719455, Fax: (R) 4465521
Email: filsep@ad1.vsnl.net.in

FOOD INGREDIENTS

Jay Chem Marketing are authorised distributors for various food Ingredients and Preservatives such as Aspartame, Acesulfame K, Calcium propionate, Carrageenan, Enzymes, Glucone, Delta Lactone, Glyceryl Mono Stearate (GMS), Mono Sodium Glutamate, Pectin, Potassium Sorbate, Sorbic Acid, Sweetners and Xanthan Gum.

The ingredients are available regularly and at competitive prices.

For your requirements, contact:

Jay Chem Marketing
B/5, 3rd Floor, Nemi Krishna Society
V. L. Road
Kandivali (W)
Mumbai 400 067
Tel: 022 8020141/8061337
Fax: 022 8061337
Email: jaychem@bom3.vsnl.net.in

CANNING MACHINES

Established by Mr. A.P. Pandeya in 1987 after closure of Metal Box Co., Cantech is a trusted name for fruit and vegetable Canning Machineries. The basic objective of the company at the beginning was to supply spares for the existing base of the Metal Box Seaming equipment used by hundreds of customers in India. Subsequently other Can Seaming Equipment were introduced.

The company has trained, skilled Service Engineers to attend various customers requirements at short notice and claims to have 90-95% of the high quality can seaming equipment business in western India, mainly Maharashtra, Goa, Gujarat, Madhya Pradesh and Karnataka. Cantech supplies and supports the following machines required for food processing and allied industries:

Semi-automatic Seamer with speed of 30-40 cans per minute, Body Reformer, Hand Flanger, Flange Rectifier, Body Bea .er, Embossing Press, Testing Equipment.

Cantech Seaming Equipment are also exported to the Middle East and various African countries.

Cantech represents Shin-I Machinery Works Co. Ltd. Taiwan for high speed seamers and Chase Manhattan Inc-Taiwan for world class OTS Cans and easy open ends.

For further details, contact:

Cantech Machines
13, Vora Bhavan
Opp. King Circle Garden
Matunga (C.R.)
Mumbai - 400 019
Tel: 409 6086/409 6853
Tel/Fax: 91-22-4096086

PA COLIFORM TEST KIT

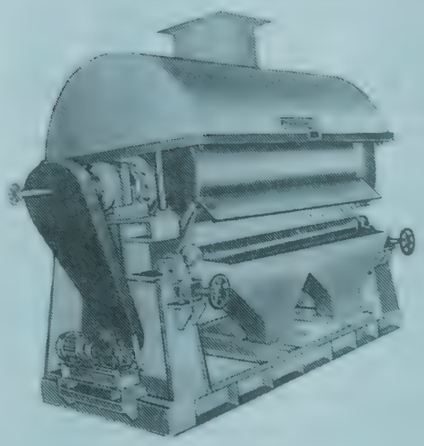
The PA Coliform Test Kit from HiMedia Laboratories Ltd., is used for the detection of presence or absence of coliform bacteria in water from treatment plants or distribution systems. Kit contains 1 sterile disposable bottle - 100 ml capacity, dehydrated medium - 3X concentration, and 1 ziplock bag.

This kit for the first time makes possible quick and easy detection of presence/ absence of coliform bacteria from Water Treatment Plants, Housing societies, Hotels and Hospitals, Office complexes, Swimming pools, Bottling plants.

For more inquiries, contact:

HiMedia Laboratories Limited,
A-406, Bhaveshwar Plaza
L.B.S. Marg
Mumbai 400 086
Tel: 5000970/3746
Fax: 022-5005764/2468
Email: sarojw@giasb01.vsnl.net.in
Website: www.himedialabs.com

CHEMICAL FLAKER



The 'Shanta Flaker and Dryer Co. Pvt. Ltd.' offers a Flaker to convert Chemicals into solid flakes. This is achieved by forming thin layer of molten product on the outside surface of a rotating drum and causing this to be solidified by spraying cooling water from the inside surface of the drum. An adjustable scrapper continuously removes the solidified material from the drum surface in flake forms. The material of construction for the drum can be mild steel, stainless steel with / without hard chrome plating. Normally Monoblock for weldable materials. This construction ensures life-long alignment, surface will be machined and ground finished. Drum Rotating on antifriction self aligning ball / roller bearing with standard housing. Heavy duty drive arrangement for smooth, continuous and trouble free running. V-Pulley or Variable speed arrangement is also provided for optimum performance. The Flaker Machine is complete with 1440 RPM, 3 Phase, 415 volts, TEFC / ISD motor, with gear box, Tray. Hopper, M.S. hood, Belt Guard. The machine is mounted on heavy base-plate for trouble free service. The optional features are Screw Conveyor, Flaker Breaker, Film thickness controllers. Complete enclosure for hazardous application.

The company also provides a pilot unit, to take running trial on receipt of samples about 15 kgs. Flaker is used in Acetanilide, Fatty acids, Monochloro acetic acid, Nickel catalyst, Naphthalene, Resin, Waxes etc.

For further details, contact:

Pragati Engineering Works
W-88 A, N-8, Chikhloli MIDC
Ambarnath - 421505 (E), Dist. Thane
Tel: 0251 682961, 687407
Fax: 0251 685054
Email: shantaflaker@vsnl.com

FOOD ADDITIVES

In today's selective and competitive food industry, it is important to make specific, distinctive, advanced and approved additives a part of the food product. The additives made by Davars M.P. Organics are under the technical knowhow of Spiess GmbH. Germany. The Food Scientists manning the R&D Laboratory are trained in West Germany and are capable of tailoring a special and specific action additive needed by the food industry.

At Davars they make Stabiliser Emulsifier System based on Carrageenan, Locust Bean Gum and Sodium Alginate for soft ice cream, binding and body agent for water lollies, candies and pepsis, texturising and body agent for sauces, ketchups, fruit drinks & jams, creaming, spreading, firming & stabiliser system for cream cheese, lubricating, binding, texturising and bodying agent for sausages, frankfurters and minced meat products, freshness retainer and quality improver for breads, buns and other bakery products.

For your requirements, contact:

Davars M.P. Organics
Tansen Road
Gwalior 474 002 (MP)
Tel: 330841, 326888, 332279, 421061
Fax: 0751-332278
Email: davars@gwrl.dot.net.in,
davars@davars.com
Website: www.davar.com

SPRAY DRYING PLANT

Besco Ltd., the Indian subsidiary of American Healthcare & Foods division introduces modern Spray Drying Plant designed for speciality ingredients to produce high quality value added spray dried powders which retain and conserve original properties of the product. The plant is made from SS 316, which is ideal for food grade application, with equipped lab and trained man power having sophisticated controls and flexibility. It is designed for most intricate spray drying application. They undertake job work and also supply a wide variety of spray dried products like encapsulated natural and artificial Flavours, Powdered Flavour Oils, Fat Substitute Powders, Foodgrade Chemicals and Ingredients, Tomato powder, Fruit juice powder, Encapsulated Oleoresins and various other spray dried food and allied Ingredients including Herbal and Nutraceutical formulations. They under take job works involving diverse spray drying application. Results are guaranteed. The entire process is monitored by qualified trained professionals.

For your requirements, contact:

Mr. S.K. Mishra
Besco Ltd. (American Healthcare & Food Division)
13/4, Mathura Road
Faridabad, Haryana
Tel: (0129) 5275338, 5275334
Fax: (0219) 5275337
Email: skmisra20@hotmail.com

MALIC ACID

Malic Acid is a major natural organic acid occuring in fruits and berries. In fact, contrary to the common belief Malic Acid is the prominent constituent of many fruits and not citric acid. The pleasant and refreshing experience of biting into a juicy apple or cherry is mostly due to Malic Acid. It is being used for several years in food products, particularly as a replacement for citric acid.

Malic acid has distinctly better properties for several specific end uses such as soft drinks, fruit juices, dry beverage products, candies etc. It's natural anhydrousness, non-hygroscopicity, non-volatility and excellent solubility are making it the "preferred acidulant" in more and more applications.

The advantages of Malic Acid • Flavour enhancer and for longer retention of flavour • Shelf life extender due to anhydrous and non- hygroscopic nature • Lower melting point advantage 129 deg. C. compared to Citric Acid MP of 153 deg C. • Better solubility, imparts greater clarity of the end product • Economical. The "Acidity & Sourness" of a product is estimated by tasting panels that 10% to 20% less Malic Acid is required than citric acid, to produce equivalent effect.

Malic Acid is listed by the FDA as GRAS (Generally recognised as safe) additives for miscellaneous and/or general purpose use. It is approved by PFA and FPO for use as an acidulant in beverages and miscellaneous Foods.

For further details, contact:

Thirumalai Chemicals Ltd.
Thirumalai House
101 Sion Matunga Estate
Scheme No. 6, Sion (E)
Mumbai 400 022
Tel: 4017834/7841/6153, Fax: 4011699

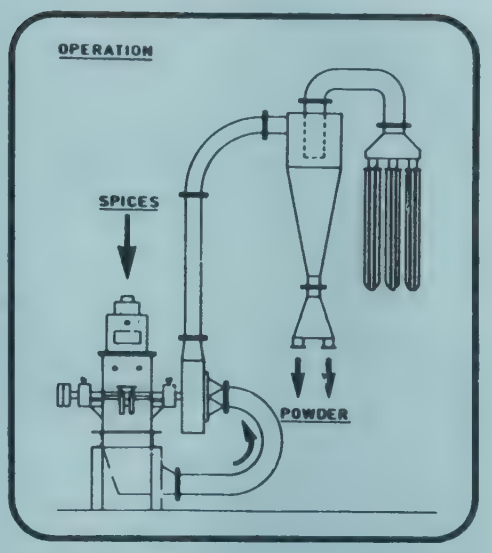
THINWALLED PLASTIC CONTAINERS

K. Raheja Mercantile Corporation are the manufacturers of transparent & opaque white injection moulded Plastic Containers ranging from 100 ml to 2000 ml. These containers are airtight, food grade, microwaveable (for reheating) as well as deep freezable, and stackable are available in various shapes. The containers have multipurpose utility and used in various Industries and such as Food Packaging industry like for Ice creams, Shrikhand, Cheese, Bread Spread, Dairy Products, Carry Home Foods, Tea, Medicines etc.

For further details, contact:

K. Raheja Mercantile Corporation
108, New India Ind. Estate
Off Mahakali Caves Road
Andheri (E), Mumbai 400093
Tel: 8382032/1529, 8394665/66
Fax: 91-22-8363458

MASALA MILLS



The Masala Mill from Lithotech Engineers can be used for various products such as chillies, turmeric, cori ander, mixed spices, dehydrated onions and garlic, etc.

The machine chamber consists of swinging hammers side liners and top liners. As the material is fed into the machine through the feeding hopper, it gets pulverized between the swinging hammers revolving at a very high speed and the liners. The perforated screen fitted in the lower part of the chamber regulates the fineness of the pulverized material depending upon its hole diameter. Once the material passes through the screen, it is sucked in by a blower unit mounted on the side of machine, which passes through the pipe, cyclone collector and finally discharged through the two way discharge valve. The air along with the very fine powder will go into the dust collector, where the material will be trapped into the filter bags and the air will be let out. The attachment of the dust collector ensures dust free operation. The free circulation of air into the machine keeps the chamber cool, thus retaining important properties of spices like taste, flavour and colour.

Salient Features are: • Retention of important properties of spices like taste, flavour and colour • Maintains uniform quality of product • Easy and economical dust free operation • Wide range of production capacities • Easy and economical maintenance • Sturdy construction • Ready availability of spares • Reliable after sales service.

For further details, contact:

Lithotech Engineers
S-2/B-25, Sector 10
Shantinagar
Mira Road (E)
Thane 401 107
Tel: 8110182 / 8113648 / 8113617
Fax: 91-22-8105808
Email: lithotech@vsnl.com

FOOD CHEMICALS

The company supplies from ready stock on behalf of principals the following:

Sodium Stearoyl Lactate (SSL), Gycerol Mono Stearate (GMS), Poly Glycerol Polyricinoleate (PGPR), Pan Release Emulsion (Actilease), Baking Premixes (Actimix), from **Ganapati Adumin Emulsifiers Ltd.;** Lactic Acid IP/Food Grade, Sodium Lactate, Buffered Lactic Acid, from **Lactochem Ltd.;** Various Flavours from **Duckworth Flavours (I) Ltd.;** Skimmed Milk Powder from **Kamdhenu Foods Ltd.** and **SMC Foods Ltd.**; Ethyl Vanillin from **Indo Vanillion Chemical Ltd.;** Sodium CMC from **Daicel Chemical (Japan);** Flavours, Chemicals/Speciality Essential Oils and Aromatic Chemicals from **Frutarom Ltd.**

The company also supplies Benxyl Chloride, Benzyl Acetate and Benzyl Dehyde.

All the above products find application in Food, Bakery, Ice Cream, Beverages, Biscuits, Confectionery, Pharmaceu-ticals and Cosmetic Industries.

For your requirements, contact:

Prabhahari Exim Pvt. Ltd.
B-3, Nirmal Indl. Estate
Next to V.V.F. Ltd.,
Sion (E), Mumbai 400 022
Tel: 22-4091833/3210, Fax: 22-4082703

DISPLAY SYSTEMS

As we move rapidly in the new millennium the visual display of ideas and information will be an integral element in our lives.

Since the inception of Alkosign display system in 1992, the ethos of exceeding customers expectations has been maintained. This is not only in project design and quality but also in innovative marketing, packaging and distribution.

It is a philosophy which ensures the high quality of all our products in the international markets, backed up by local distribution and customer support.

Whether at schools, offices, labs, meetings, conferences or for presentation to customers, you need to clearly project your information, "Alkosign" high quality white boards, pinboards, felt boards and flip charts board stands, offer flexible, space saving solutions for any situation.

To be convincing, message needs to be clear and visible. To communication efficiently, you need to see Alkosign's vast range of highly practical, well thought-out products. Alkosign, the name in professional visual communication, has successfully established its place in the market.

Our range of products have been specially designed for any occasion to allow

you to communicate full ideas and context with maximum clarity.

For further details, contact:

Alkosign Display Systems
Plot No. 58, DD Govt. Industrial Estate
Kandivli (West)
Mumbai 400 067
Tel: 8688025/8684070
Fax: 8694814
Email: alkosign@vsnl.net
Website: www.alkosign.com

FOOD COLOURS

Narmada Food Colours Pvt. Ltd. are manufacturers and exporters of water soluble as well as lake Food Colours such as Tartrazine, Sunset Yellow FCF,Carmoizine, Ponceau 4R, Erythrosine, Brill, Blue FCF, Indigo Carmine, Quinoline Yellow WS/SS, Amaranth and variety of mixtures and blends.

For further details, contact:

Narmada Food Colours Pvt. Ltd.
Sanghrajka House, 4th Floor
431, Dr. Dadasaheb Bhandarkar Marg
Opera House
Mumbai 400004
Tel: 3801315, 3801316
Fax: 0091-22-3801337
Email: dadajee@bom7.vsnl.net.in
Fact: Plot 282, Village Kardej (Navagam)
Bhannagar 364060, Gujarat

CHEMISTIK FLOORING PRODUCTS

Designed to solve a host of flooring problems, formulated to enhance the life of various surfaces and strengthen floors to withstand the heaviest of industrial traffic, CHEMISTIK specialised Flooring Products have proven their versatility and strength even in the most hostile environments.

The range of products from Chemisol Adhesive Pvt. Ltd. are

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- Chemistik Epoxy Slurry Mortar
- Chemistik Floor Resurfacer
- Chemistik Dust Proofer
- Chemistik EP PLUS-500
- Chemistik EP PLUS-800
- Chemistik EP PLUS 1000 SL.

These find application wherever bonding is required on different types of floors.

For more details, contact:

Chemisol Adhesives Pvt. Ltd.
7/10 Botawala Building
8 Horniman Circle
Mumbai 400 023
Tel: 2625389/5520/6354/6452
Fax: 2625610
Email: bom@chemisol.com

COLD ROOMS

Geerlofs Refrigeration from Netherland are specialists in setting up precold and cold stores, freezer stores, blast freezer & I.Q.F. for storage of fruit, vegetables and agricultural products. They are useful in Horticulture * Floriculture * Tissue Culture, Agricultural products * Seeds, Spices & Herbal Products * Food & Dairy Products, Meat, Fish * Poultry * Warehouses * Cargo Complexes Supermarket outlets.

For further details, contact:

Geerlofs Cooling India Pvt. Ltd.
(Old No.43) New No. 69
Fourth Avenue, Ashok Nagar
Chennai 600 083
Tel: (O) 44-489 9340/41
Fax: (O) 44-489 9343
Email: geerlofs@vsnl.com

WHISKY FILTRATION

Filtration of whisk(e)y, either single malt or blended types, after blending is vital to ensure life, stability and good clarity. To this end the removal of hazes and the precursors to haze formation, is particularly important. Consequently, the steps used in filtration of different types of whisk(e)y require careful control and correct choice of filter equipment and media. Carlson Filtration is highly regarded for its expertise in the area of whisk(e)y filtration and has developed a number of high performance filter sheets specifically for the industry.

There are two types of haze and precipitation problems associated with whisk(e)y, which can be broadly classified as chemical and physical:

Chemical hazes result from trace metal contamination and the consequent formation of metal complexes with tannin and colouring matter. The problem of trace metal contamination can be reduced by careful choice of materials used in process and production plant. Another source of chemicals haze arises from the water used to reduce whisk(e)y to bottling strength. On dilution whisk(e)y produces a turbid, cloudy appearance which reaches an equilibrium after about 24 hours, prior to filtration.

Physical hazes and their associated precipitation problems are much more difficult to deal with. These physical hazes require liquid/liquid separation as opposed to the elimination of solid particulate matter usually associated with filtration. The liquid phase requiring removal from whisk(e)y comprises ethereal oils. The problem of their removal is made more complex because they may show up as a haze in bottled product, despite the fact that the product may have been perfectly bright at the time of bottling.

Whisk(e)y shipped to countries with low ambient temperatures may throw a haze due to the temperature reduction. For this reason, most whisk(e)y is filtered after chilling to avoid this problem. Typical temperatures used vary between zero to plus 4^{0}C. The sheet filtration process used in the whisk(e)y industry may be in lenticular or sheet filter format and either single or dual step: Single step filtration takes place at 0-4^{0}C when bottling at 20^{0}C and typically uses Carlson's specially developed XE280 sheet.

Double or two stage filtration is being increasingly used nowadays. Typically, the first stage uses XE5 for removal of larger particulate matter and XE350 is used to achieve high levels of polish or clarity in blended products. XE200 is used for the polishing step for single malts. It is very important to avoid any surging or pressure shocks whilst filtering whisk(e)y because there is a build up of viscous oils on the surface of the filter sheet and excess flow rates or significant variations in pressure may force these oils through the pores of the sheet. The maximum pressure drop tolerable across most filter presses is 2 bar and this level usually indicates that the filter needs to be cleaned and redressed

For further details, contact:

Carlson Filteration (India) Pvt. Ltd.
203 Malwa, Patanwala Estate
LBS Marg, Ghatkopar (W)
Mumbai 400 086
Tel: 500 6755, Fax: 5001358
Email: carlsonindia@carlson.co.uk

AUTOPACK

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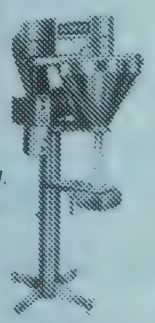
POWDER DOZING MACHINE
MODEL P.D.- 30

Dozing unit for accurate filling of powders like tooth powder, talcum powder, baby powder, dry syrups, coffee etc. in pouches or containers.

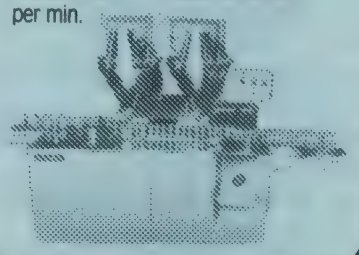
- Output upto 2000 fills/hr.
- Power input 0.75 kw.



AUTOFILL
MODEL P.F.- 90

Completely automatic powder filling machine for filling all types of powder in bottles/containers of different sizes and shapes.

- Output upto 70 bottles/containers per min.



CREAM FILLER
MODEL C.F.- 30

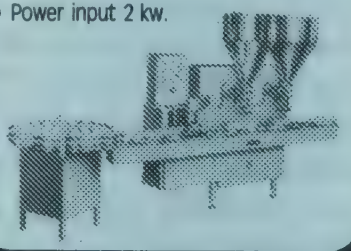
Filling machine for creams, grease adhesives, lotions, balms, gums etc. in pouches or containers.

- Output upto 2000 containers/hr.
- Power input 0.75 kw.

AUTOMATIC CREAM FILLING MACHINE
MODEL C.F.- 70

For filling of grease, adhesives, creams, lotions, balms, gums etc. in rigid containers.

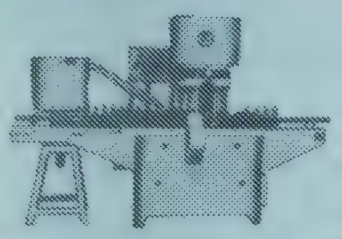
- Output upto 4500 containers/hr.
- Power input 2 kw.



AUTOMATIC ROTARY CAPPING MACHINE
MODEL A.C.- 6

Rotary capper for automatic capping of prethreaded plastic caps on to bottles of different shapes and sizes.

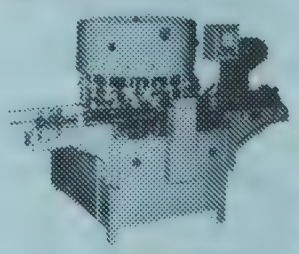
- Output upto 120 bottles/min



AUTOMATIC ROTARY SEALING MACHINE
MODEL R.S.- 16

Automatic Rotary Sealing machine for plastic inserts/plug onto HDPE/LDPE bottles.

- Output 120 bottles/min



HORIZONTAL PILLOW-PACK MACHINE
MODEL H.B.- 80

Ideal for packing solid products like chocolates, cello-tapes bandages, biscuits etc. and other food, pharmaceutical cosmetic products in solid form with heat sealable films & laminates

- Output upto 120 packets/min.

AUTOMATIC CARTON OVERWRAPPING MACHINE
MODEL A.W. 120

Automatic wrapping machine for overwrapping rectangular cartons with B.O.P.P./Cellophane like tooth brush carton, cassettes & blade carton etc.

- Output upto 120 cartons/min

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e.mail : sriramco@md3.vsnl.net.in

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factory : d-6 midc ambad nasik - 422 010
tel. : (0253) - 382 630

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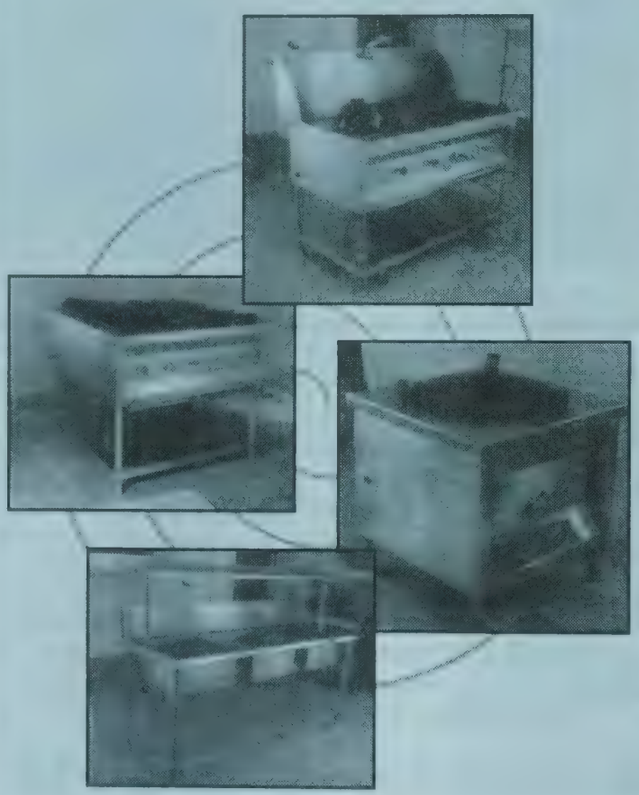
AND CUSTOM BUILT EQUIPMENTS



SREE Annapoorna
Kitchen equipments Ltd.

Sree Annapoorna Farm, Thondamuthur Road, Vedapatti, Coimbatore-7, Tamil Nadu. Phone : 473469 Fax : 0422 - 547322

ADMN. OFF : 418, Mettupalayam Road , Coimbatore - 641 043
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QuatCide 304

For Clean and Germfree work areas

- ⇨ Broad spectrum disinfectant.
- ⇨ One step sanitizer and cleanser.
- ⇨ Long lasting residual action.
- ⇨ Non toxic, odourless, no undesirable effects.
- ⇨ Works at low concentrations (100-500 ppm).
- ⇨ Non corrosive and safe to handle.
- ⇨ Ozone free, non cancerous.
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QuatCide 304 is based on quaternary ammonium compounds which are known to be "harmless" biocides. QuatCide 304 has an instant killing action on microbes and retains the action for over 12 hours. QuatCide 304 is one of the products in the range of sanitizers and disinfectants manufactured by us.
With on-site microbiological testing services and support to compliment our products, you can trust us to solve more than one problem for you.

QuatCide 304 has applications in:

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- ✓ **Breweries**
- ✓ **Beverage manufacturers**
- ✓ **Cold Storage houses**
- ✓ **Poultry Farms**
- ✓ **Hotels and hospitals**
- ✓ **Milkfood manufacturers**

Please contact:
Chembond Chemicals Limited
Chembond Centre, EL-71, Mahape MIDC,
Navi Mumbai 400 705. INDIA.
Tel: (22) 761 8799 ♦ Fax: (22) 768 1294
E-mail: chembond@vsnl.com

Visit us on the Internet at: *www.chembondindia.com*

Inquiries for dealership are welcome

PROCESS FILTERS

Water treatment major Ion Exchange (India) Limited has entered into an agreement with Parker Hannifin Corporation, USA for exclusive distributorship in India of the Parker range of process filters. The US based $ 5 billion turnover Parker Hannifin Corporation is among the world's largest manufacturers of hydraulic and process filtration systems.

Parker offers the widest range of process filters including the pleated filter, resin bonded and melt blown filter cartridge series. The range includes a unique polypropylene backwash filter that offers customers tremendous advantages in terms of savings in replacement costs, reduced downtime and reduced disposal problems.

Parker process filters are used for particulate removal in process applications as well as water and waste water treatment in diverse industries such as surface coating, electronic, food & beverage, and petrochemical.

Ion Exchange (India) Limited has over 15 years of experience in the design, manufacture and supply of process filtration systems. Specialists in water and waste water treatment for over three decades, the company is one of few worldwide with a complete range of technologies, products and services, enabling it to offer total water management for industries, homes and communities.

For further details, contact:

Ion Exchange (India) Ltd.
Tiecicon House
Dr. E. Moses Rd. , Mumbai 400 011
Tel: 022 4939520, 23, 25, 31, 32
Fax: 022 4938737

TURNKEY MINERAL WATER PROJECT/WATER TREATMENT

Aguapuro Equipments offer turnkey mineral water projects and water treatment projects ranging from Dosing Equipment, Multimedia Sand/Carbon Filters, Softeners, Demineralisation Systems, Reverse Osmosis Systems (UF/ NANO), Micron Filters/UV, Sterilizer systems, Ozonators. They also provide spares and services for any make of water treatment plants.

Special features of these are • compact skid mounted systems • specially designed for individual application • Economical and fast delivery.

The company also provides turnkey projects for manufacturing mineral/pure water.

For further details, contact:

Aguapuro Equipments
2/22, Panwala Bldg.
Dr. S.S. Rao Road
Lalbaug, Mumbai 400012
Tel: 4101432, 4155576, Fax: 4155576
Email: aquapuro@vsnl.com

ION EXCHANGE RESINS

Doshi Ion Exchange and Chemical Industries Ltd., one of the leading water treatment companies engaged in the business for over 18 years manufacture a wide range of Cationic and Anionic Ion Exchange Resins for water and non-water applications. The company offers a complete range of Water Treatment Plants such as Softners, Demineralisers, Multi Grade Filters, Dealkalizers, Degassifiers.

Doshi Ion also offers Reverse Osmosis Plants for sea water, brackish and waste water treatment, using DOW Film Tec-USA which make TFC Membranes. Doshi Ion offers custom built plants to suit the customer's requirement of both quality and quantity. The company also offers pre-engineered standard packaged units.

Dosh Ion has tied up with CELGARD, GmbH - a member of the Hoechst group of companies for their special membrane product. Using these most modern state of art membranes, Doshion designs and supplies systems for various applications viz. Fruit juice Concentration/Clarification, Sugar deashing, Beer/Wine purification, Bacteria Pyrogen removal, Milk/Whey concentration, Ultra high purity system.

Whatever your water management needs from Analysis to turnkey systems, Doshiion offers a single source expertise in all areas with single sources responsibility.

For further details, please contact:

Doshi Ion Exchange & Chemical Industries Ltd.
24, 25, 26, Phase-II
G.I.D.C. Vatwa
Ahmedabad 382445
Tel: 5831136, 5891916
Fax: 91-079-583 3302

FOOD COLOURS

Vidhi Dyestuffs Manufacturing Limited (VDML) is engaged in the manufacture of certified food colours. The unit offers high-quality products for the global as well as local markets. VDML has accomplished a pathbreaking feat by manufacturing water soluble food colours with salt content - below 5%. In a marketplace that's expanding in terms of size as well as challenges, VDML emerges as a leading manufacturer for an ever-widening gamut of industries which consume food colours - from food & foodstuffs, soft drinks, ice-creams, confectionery, pharmaceuticals, toiletries, cosmetics, food packaging, toys to other special industrial items. Over 95% of the company's production is exported to leading countries of the Europe, Far East, Latin America and Australia.

The unit has an installed production capacity of 60 MTPM, with a provision to double the same in near future. The plant is well laid-out to provide for economy and operational ease and is well-equipped with ultramodern machinery to facilitate efficient processing. Furthermore, with its commitment to the environment, the company has virtually banished atmospheric pollution from the unit, while pollution from liquid discharges has been minimized.

The VDML range of food colours include * **Primary colours:** The water soluble variety that's available in granulated, normal powder and microfine forms * **Blends of primary colours:** For getting different material shades * **Metallic lakes:** Generally aluminium and calcium - these are insoluble in water and widely used in surface coatings, capsules, food packing material, etc.

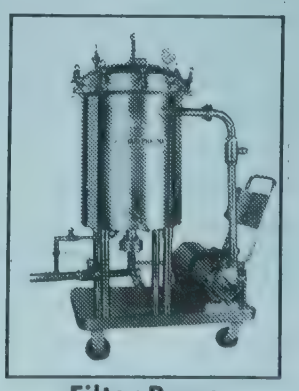
For further details, contact:

Vidhi Dyestuffs Mfg. Ltd.
E-27, Commerce Centre
78, Tardeo Road
Mumbai 400 034
Tel: 91-22-4944349/4942864/4974347
Fax: 91-22-4971980
Email: vidhi@bom4.vsnl.net.in
Website: www.vidhifoodcolours.com

FILTER PRESS

Kothari Pharma, a Mumbai-based company, offers a unique Sparkler Type Horizontal Filter Press, which enables over come all filtration problems in pharmaceuticals, chemicals, distilleries, beverages, oil, ink and other such industries. The Filter Press has a sturdy body made out of high quality SS 304/316/316L metal, and comes with a mirror-polished finish.

Kothari Pharma offers various models of the Filter Press depending on output and quality of liquids. The standard models available are in the range of 8", 14", 18", 24" and 33". The filtration capacity ranges from 600 1/hr to 30,000 1/hr and the cake holding capacity from 2.2 ltrs to 230 litres. The flow rate and pump selection depends on the viscosity of the liquids.



Filter Press standard model with back wash

The heart of the Filter Press is a filter cartridge assembly having SS filter plates, support screen, interlocking cup and pressure tank. Fitted with an ISI certified motor covered by SS sheet, the Filter Press is mounted on moveable SS trolley fitted with fibre castor wheels for easy movement. After filtration, the Filter Press facilitates easy removal of the cake (left-over solid matter) formed between the plates. Other salient features of the equipment includes a sample collecting device and a facility for filtering out hold up of the liquid. The convenient modular design of the filter press ensures easy operation and maintenance-free function.

Kothari Pharma, which has established a reputation in the production of a wide range of filtration equipment for the pharmaceutical and chemical industries, also offers special facility for trial on the Horizontal Filter Press.

For further information, contact:

Kothari Pharma
C/11, M.K. Bros Indl. Estate
Jarimari
Andheri-Kurla Road
Andheri (E), Mumbai - 400072
Tel: 8510837, 8512794, 8592888
Fax: 8513584

FLAVOURS/FRAGRANCE SPECIALITIES, RESIMOIDS

H.R. Daniel, UK is one of the leading supplier for Flavours/Fragrance specialities, Resinoids, Essential Oils. H.E. Daniel have been supplying these products to Food, Pharmaceutical, Tobacco, Perfumery Industries. The Balsam Tolu, Balsam Peru, Nutmeg, Copaiba, Rosemary, are some of the specialities from H.E. Daniel Ltd., UK.

Fats/Oils/Emulsifiers: Durability and freshness are focal points in the Food Industry. We offer from Condea Chemie, Germany a range of natural based raw materials to meet these demands. The range of food additives cover a number of products developed specifically for the Confectionery, Bakery, Pasta Industry, Potato and Fruit-processing industry. The main varieties in: Fats: Hard Fats, Soft and Filling Fats, Toffee - fat, Monoacid Triglycerides Oils - Special oils, MCT-oils. Emulsifiers, Release Agents & Lubricants, Non-stick & glazing agents, Anti-foam agents.

For your requirement, contact:

S. Zhaveri & Co.
109, Shiv Smriti Chambers
49, Dr. A.B. Road
Worli
Mumbai 400 018
Tel: 91-22-4932949, 4932044
Fax: 4930300, 4952742
Email: szhaveri@bom3.vsnl.net.in

QUATCIDE 304

Chembond Chemicals Ltd. is an ISO 9002 certified Mumbai based company, manufacturing speciality chemicals, serving various industrial sectors since the last 25 years. Chembond has a wide range of Biocides, and Disinfectant Chemicals based on Quaternary ammonium compounds, Sodium Hypochlorite, Dichlorophone, Methylene bis-Thiocynate, etc. giving excellent customer satisfaction with their use.

QuatCide 304 is based on Quaternary Ammonium compound a broad-spectrum performance oriented speciality product of Chembond's latest technology. QuatCide 304 is a blend of unique Quaternary ammonium compound, powerful dispersants and stabilizers, which gives a synergistic effect to control microbial population.

It is an excellent chemical sterilizer with a broad spectrum of activity on all kinds of bacteria, fungi, viruses, algae and protozoa. QuatCide 304 is a revolutionary disinfectant, which is easy to use, harmless, metal free, stable, non-corrosive, non-carcinogenic, have alkaline pH and eco-friendly.

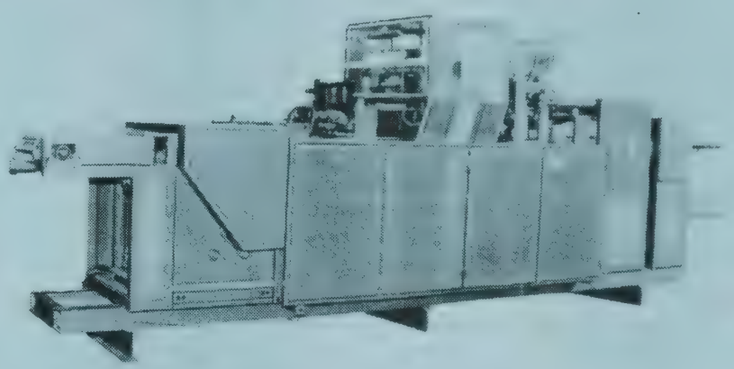
The best advantages of QuatCide 304 is a cost effectiveness as it works at low concentration and in short time.

QuatCide 304 is specifically formulated for the industries like Dairies, Food Processing, Pharmaceutical, Cosmetic, Beverage, Cold Storages, Hospitals, where sterile conditions are required in the manufacturing system and at work place.

For further details, contact:

Chembond Chemicals Limited
Chembond Centre
EI-71, Mahape MIDC
Navi Mumbai 400 705
Fax: (91-22) 7681294
Tel: (91-22) 7618799, 7681354
Email: chembond@vsnl.com

AUTOMATIC THERMO FORM-FILL-SEAL



Wonderpack Industries manufacture high speed Automatic Thermo Form-Fill-Seal system, Model TFS-3040 that offers simple, speedy, economical and cost effective solution to a multitude of packaging problems and applications. Machine is designed in a modular fashion to suit individual packaging applications.

Application: The scope and versatility of this system is to say the least, simply breathtaking, and is suitable for varieties of products i.e. liquid, powder, paste and solids for regular as well as irregular shaped products like toothbrush, toys, cosmetic items, disposable syringes, foodstuffs, stationery and cutlery items, engineering components, electrical/electronic parts etc. can be packed speedily and economically without involving too much cumbersome manual operation.

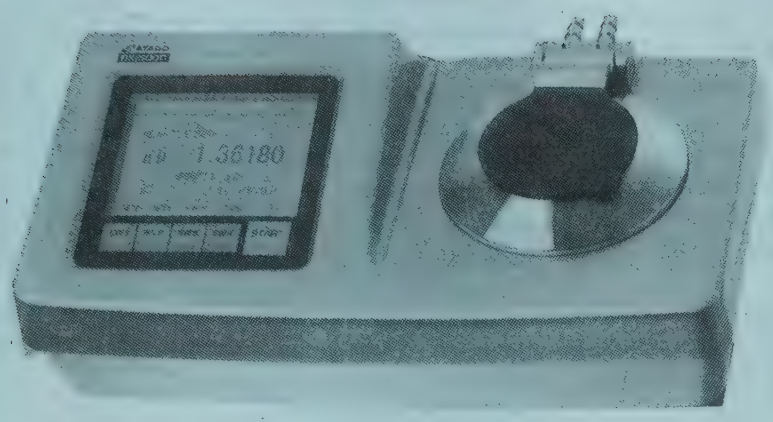
Salient Features: • This system is fully automatic, facilitating perfect synchronising of forming, filling, sealing and cutting operations and is suitable for various material such as PVC, HIPS and other formable Thermoplastic • The width and the travel can be adjusted in the machine to suit size and shape of the blister formed containers as per the die to minimise the wastage of material • Machine is well equipped with true infrared ceramic/contact heating elements for power saving and uniform heat distribution • Machine facilitates the use of plug assist, male/female Moulds, Vacuum and also only male as well as female moulds for specific requirements • Ease of handling and extreme reliability makes it suitable for any sector maximising safety of both, operators and products • Exact sealing temperature is maintained with digital temperature indicator cum controller or Thermostat control. • Machine has large forming area with 120mm draw, therefore large size of products can be packed easily • Speed of the machine is infinitely variable to suit individual products • All change parts are easily accessible and change-overs are easily affected.

The Indian Institute of packaging has been awarded Wonderpack Industries "Pacmachine 2000" in recognition of excellence in Packing Machine and Development for 2000.

For further details, contact:

Wonderpack Industries (P) Ltd.
P.O. Box No. 29127
321, T.V. Ind. Estate
Worli, Mumbai 400 025
Tel: 494 9580/493 4736/493 6496
Fax: 91-22-493 8796
Email: wonder@bom3.vsnl.net.in
Website: http://www.wonderpack.com

REFRACTOMETERS & COLOURMETERS



Testek Corporation offers a range of Refractometers (Hand-held, Abbe & Digital) manufactured by *ATAGO Co. Ltd.*, Japan. ATAGO, Japan refractometers have been highly popular all over the world in F&B Industries for checking Brix% (sugar%) accurately and reliably.

For measurement of colour and colour difference Testek offers range of Colour Measurement Instruments manufactured by X-Rite Inc., USA. The colour of a product is perceived as a quality and variance in colour can be checked for difference in quality. X-Rite, USA offer range of portable as well as benchtop instruments.

For more details, contact:

Testek Corporation
Shop # 2, Nilkanth Smruti
Shimpoli Road
Borivali (West), Mumbai - 400 092
Tel: 899 8162, 8998163
Fax: 91-22-899 8164
Email: testek@vsnl.com

BLENDERS

Magumps, already a well reputed and known name in the field of pharmaceutical bulk drug process industries for high quality equipment and plants introduces different types of blenders depending on type of blending / nature of product / volume to be blended etc. Type of blenders available are V Blender / Octogonal Blender / Mass Mixer / Ribbon Blender / Drum Mixer etc. These are made with all contact parts in S.S. 304 / 316 quality. The drive is given through suitable Motor / Gear Box complete machine can be made in S.S. as per latest GMP Standard.

The company has already supplied such blenders to different customers in the food industries manufacturing Noodles, Gulab Jamun Mix, Iddle Mix etc. upto maximum capacity of 2000 ltrs.

For further information, please contact:

Magumps
Trisandhya 'A'
97, D. Phalke Road
Dadar, Mumbai 400 014
Tel: 4113572/4154474
Fax: 022-4137648
Email: magumps@bom5vsnl.in

ION EXCHANGE/ADSORBENT RESINS

Pharmaconcept are the official distributors for Ion Exchange and Adsorbent Resins from Resindion S.R.L., a company of Misubishi Chemical Corporation. **MCI Gel**, available in bulk packging for **HPLC, Diaion Sepabeads** in preparative grade and **Diaion Sepabeads Relite** in industrial grade, find application in enzyme purification and immobilisation, sucrose & starch hydrolisates purification and separation, whey and lactose demineralisation, fruit juice debittering and decolorisation, amino acids and carboxylic acids recovery and purification, gelatin purification etc.

For further details, contact:

Pharmaconcept
203, Malwa, Patanwala Estate
L.B.S. Marg, Ghatkopar (W)
Mumbai 400 086
Tel: 022-5003400, 5006777
Fax: 022-5001358
Email: sis@bom3.vsnl.net.in

LACTIC ACID

Lactochem Limited, part of the **Malladi Group** is the largest manufacturer of International repute for L (+) Lactic Acid in India. Other products are Calcium Lactate / Sodium Lactate. Food Grade Lactic Acid comes with ISI mark mandatory as per PFA. **Lactic Acid** being a mild acid is used as a natural acidulant and is renowned worlds over for its Flavour Enhancing capabilities. Lactic Acid finds application in Confectionery / Breweries / Beverages / Dairy / Bakery / Meat processing / Pickling of Gherkins & Olives etc. **Calcium Lactate** worlds best source of Calcium for humans, is used in Energy Drinks and in making Channa/ Paneer. **Sodium Lactate** is used by the Meat Processing industries for its reduced water activity and improved shelf life.

For further details, contact:

Lactochem Limited
No.52, Jawaharlal Nehru Road
Ekkattuthangal, Chennai 600 097
Tel: 044-2345881,2345882,2340026
Fax: 044-2345884, 2340104
Email: marketing@malladiinc.com

CARBONATED/NON-CARBONATED PACKAGING MACHINES

For your requirements of Carbonated and non-carbonated packaging machinery for soda/mineral water, soft drink/ alcohol, and other uses, Shriyan Enterprises offer fully automatic Premix/ Carbonator for proportionate mixing of syrup, water and CO_2 with a capacity of 500 to 10,000 L.P.H. They also offer among among their other range of machines, the Counter Pressure Filler with a range of 60/120/180/240 BPM for PET and Glass Bottles.

For more details, contact:

Shriyan Enterprises
B/5, Ghansyam Industrial Estate
Veera Desai Road , Andheri (W)
Mumbai 400 053
Tel: 022 636 9057 / 8328
Tel/Fax: 022 636 8320
Email: shriflow@vsnl.com

WEIGHMETRIC FILLING SYSTEMS

Spanpak Systems is a Mumbai-based company known for manufacturing new concept Semi Automatic and Automatic Volumetric Liquid Filling Machine. The company has now introduced filling systems by weight which are manufactured to high standards of quality and durability yet economical with sophisticated electronic functions for filling jerry cans, drums etc. accurately and efficiently.

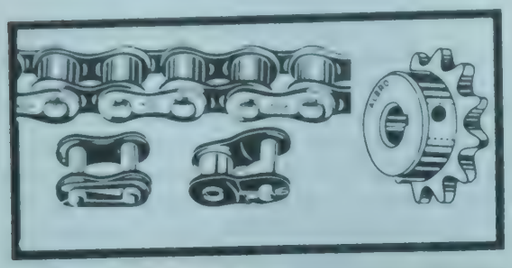
The filling system has the following features: ● Non drip diving nozzles with automatic drip tray. ● Two stage coarse/ fine fill. ●Under fill protection (tops up automatically if filling quantity is less than target quantity). ● No container No fill. ● Heavy duty gravity roller conveyor on scale platform. ● Micro processor control system with backlit LCD digit height of 20 mm of easy readability with numeric key pad for easy fill cycle setting. Optional RS 232 port for further data processing or recording. ● Parts in contact with the product either in SS-304/316 or treated mild steel. ● Supplied with or without pumpset ● Also available in explosion proof version. ● State of art design conforming to world standards Mettler Toledo weighing systems incorporated.

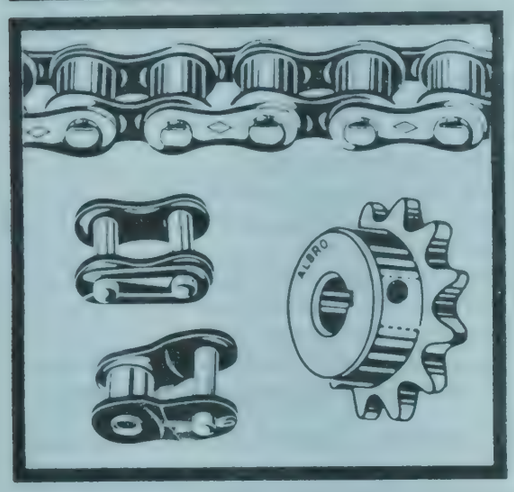
The company also manufactures optional equipments like entry and take away conveyors, palletizers, capping machines and special purpose machines for end of line packaging applications

For more details, contact:

Spanpak Systems
B-136, Ghatkopar Industrial Estate
Off L.B.S. Marg
Ghatkopar (W)
Mumbai - 400 016
Tel: 5170184/5170144, Fax: 5173352
Email: spanpak.filling@axcess.net.in

MATERIAL HANDLING EQUIPMENT





ALBRO, leader in Mechanical Power Transmission, specialises in superior quality Material Handling Equipment, available ready stock and made to customers' specifications and individual requirements as per sample in Mild Steel, Cast Iron and Carbon Steel, etc.

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Albro Trading Co.
42-44 Bhajipala Street
Mumbai 400003
Tel: 3424336/3441194
Fax: 022-3447116
Website: http//www.softrax.com-albro

RANGE OF EQUIPMENT

Adam Fabriwerk Pvt. Ltd. design and manufacture equipment for food, ayurvedic and allied industries keeping in view the technological developments in the world.

We offer complete manufacturing facility for Shrikhand with GMP (paint free construction) and CIP and SIP for batch size of 100 to 5000 kgs. The facility consists of manufacturing vessels / transfer pump / working platform / product piping / storage vessels / electrical control panel / vacuum pump / metering pump.

The salient features of our facility are: • The plant is designed to be operated and one helper. • Material tranfers are done by vacuum. • Vessels are GMP (paint free construction) and are suitable for vacuum. • Gaskets used are of silicon (food grade). • Contact parts are of SS316 and are finished to class 4B (Mirror) finish and are crevice free. • Entry of high shear emulsification head is from bottom through a specially designed mechanical seal and water circulation system equipment with water detection sensor. • The high shear emulsification head is bottom mounted and acts as a pump to recirculate the products during manufacturing and discharges the product in storage vessels after the process is completed. • Vessels are designed for 1kg /sq. cm. and 700 mm vacuum and can be sterilised. • The storage vessels are of 500 kgs. for all sizes of plant above 500 kgs. and are mobile and can be connected to the filling machine through digital metering pump. • Pipes, pipe fitting and valves are of SS 316, seamless, internally electropolished with DIN standard unions, • The control panel visually shows all operations of the plant on a mimic diagram. • Manhole of all the vessels are equipped with davit fitting and the cover of the manhole slides instead of being lifted.

For more details, contact:

Adam Fabriwerk Pvt. Ltd.
203, Rajgure Apts.,
New Nagardas Road
Andheri (W), Mumbai-400069
Tel: 022-8380548/8384173
Fax: 022-839-0195
Email: adamfab@vsnl.com

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Om Engineering Works also manufacturer of * Sigma ZZ Horizontal Dough Mixer for 150kg to 300kg Dough, Biscuits Rotary, Moulding & Cutting Machinery 24", 33" & 40" with Dough Laminators & Precision Gauge Rollers. Biscuit Baking Ovens, Gas, Electric or LDO Fired in Sizes & Lengths as required by customer with Cooling Conveyor, Stackers & Stacking Table. Biscuit Packaging Machines both EWP & Pillow Pack are also available.

For further details, contact:

Om Engineering Works
222, Sector 6
Panchkula-134109
Tel: 0172-578525, Telefax: 585850

THINWALLED PLASTIC CONTAINERS

K. Raheja Mercantile Corporation are the manufacturers of transparent & opaque white injection moulded Plastic Containers ranging from 100 ml to 2000 ml. These containers are airtight, food grade, micro-waveable (for reheating) as well as deep freezable, and stackable are available in various shapes. The containers have multipurpose utility and used in various Industries and such as Food Packaging industry like for Ice creams, Shrikhand, Cheese, Bread Spread, Dairy Products, Carry Home Foods, Tea, Medicines etc.

For further details, contact:

K. Raheja Mercantile Corporation
108, New India Ind. Estate
Off Mahakali Caves Road
Andheri (E)
Mumbai 400093
Tel: 8382032/1529, 8394665/66
Fax: 91-22-8363458
Email: sales@krahejacontainers.com
Website: http://www.krahejacontainers. com

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Metal Plants manufacture and supply • Distillation plant for geranium, citronella, lemon grass oil • PLC Controlled automated Batching/Blending Systems • MS-3 Emulsifiers, Contra Rotary Mixers • Process Equipment such as Reactors, Heat Exchangers, Columns, etc.

For further details, contact:

Metal Plants
17, Anupam Indl. Estate No. 2
Off Pt. M.M. Malaviya Marg
Mulund (W)
Mumbai 400 080
Telefax: 5610628, 565 4607
Email: koppa@bol.net.in

FLAVOURS/ESSENTIAL OILS

The company manufactures a wide range of Liquid Flavours, Emulsions and Pastes, Culinary Essences and Essential Oils which find application in industries like aerated and non-aerated Soft Drinks, Biscuit & Confectionery, Dairy, Snacks & Savouries, Chewing Gums, Health Beverages, etc.

For your requirements, contact:

Nova Flavours & Fragrances (P) Ltd.
301, Sterling Estate
3rd Floor, Plot No. 8
Inside Spectra Motor Compound
Ramchandra Lane, Extension
Kachpada, Malad (W)
Mumbai 400 064
Tel: 8446405,8446481 Telefax: 8812059
Email: hopl@bom5.vsnl.net.in

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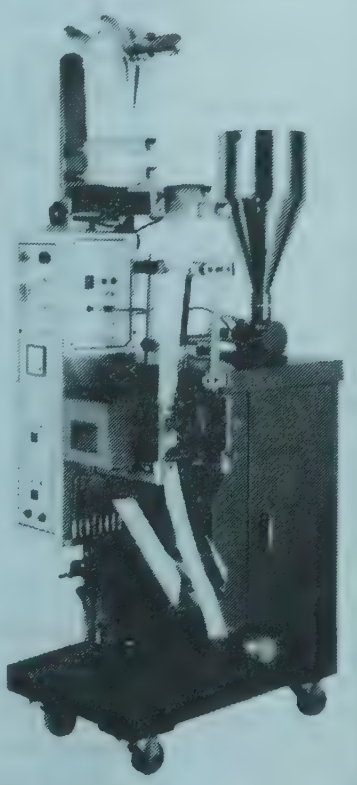

Application:
For Packing various liquid & Paste such as Shampoo, Cream, Soysouce, Butter, Mayonaise, Jam, Seasoning solution, Detergent paste etc. Machines also available for packing granules/ Powders & Oil.

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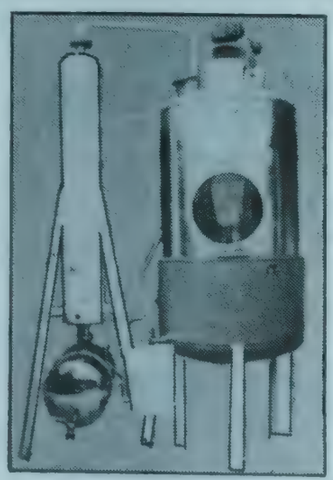
PLEASE CONTACT:

Geerlofs Refrigeration b.v.
Delftweg 66, 2289 BA Rijswijk
P.O.Box: 137, 2600 AC Delft
The Netherlands
Tel: +31 (0) 70 319 2132
Fax: +31 (0) 70 319 2156
Email: export@geerlofs.nl

Geerlofs Cooling India Pvt. Ltd.
(Old No. 42) New No. 68
Fourth Avenue, Ashok Nagar
Chennai - 600 083
Tel.: (0) 44-489 9340/41
Fax: (0) 44-489 9343
Email: geerlofs@vsnl.com

GEETA FOOD ENGINEERING

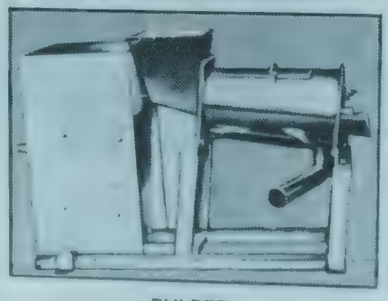
Manufacturers of Food Products Equipment & Fabricators



VACUUM EVAPORATED UNIT

PICKLE FILLING MACHINE

STEAM JACKETED KETTLE



PULPER

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GEETA FOOD ENGINEERING

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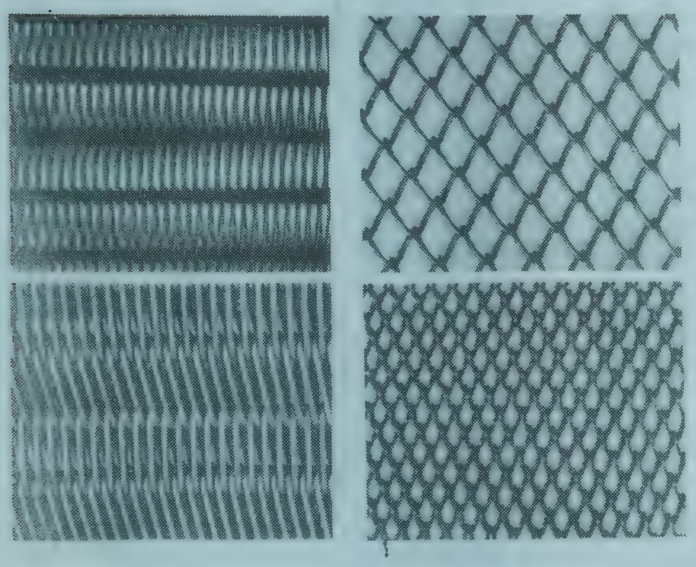
Behind Savita Chemicals Ltd., Navi Mumbai 400 705
Tel: 7906450, 7906451, 7610907
Resi: 7662098 • Telefax: (022) 7610907

METALLIC CONVEYOR BELTS



TNF Engineering is among the leading suppliers of Metallic Conveyor Belts in India. The Belt division of TNF Engineering was started in the year 1979 and since then it has catered to various process engineering applications where the strength of steel is the only possible solution. TNF Belts are manufactured with best quality wires available in the market with quality workmanship and precision going into every Belt manufactured.

TNF can provide Wire Conveyor Belts to withstand a temperature range of 10° Celsius to 1150° Celsius. Each Belt manufactured by TNF is factory inspected for accurate specifications and workmanship. TNF Engineering manufac-tures Belts in various weaves and specifica-tions to meet process requirement of any application. TNF Enginee-ring also manu-factures non standard Belts as per client requirement, specification or samples.

Among the various belt weaves some of the most common are: **Balance Weaves:** The balance weave consists of left and right hand spiral coils joined together by crimped cross members. The balanced spiral weave Belts are the most widely used Belts due to its high flexibility, even distribution of pulling forces and straight running of the belts.

Closed Pitch Gratex Weaves: The Closed Gratex belt Weave consists of very close pitched left and right hand spiral coils weaved together with straight cross members. The closeness of the weaves results in strong longer lasting Belts even in high temperature.

Conventional Link Weave: The Conventional Link Weave consists of either left or right hand spiral coils interlaced together to form a continuous Belt. These type of Belt are generally used for drying of light food articles etc., where high air circulation is needed.

Rod Reinforced Weave: This weave has relatively elongated spiral woven together and reinforced by inserting a straight cross rod between them.

For your requirements, contact:

T.N.F. Engineering
Plot No.72 B
CIDCO Service Indl. Area
Turbhe, New Mumbai - 400 075
Tel: 768 4582, 768 8705, 767 0780
Fax: 91-22-767 0780

TWIN SPRAY DRYING FACILITY

Sarvaiya Chemicals Industries, a re-puted private limited company estab-lished in 1989 offers twin spray drying (S.S. 316-L) facility at Vapi in Gujarat.

The facility is used for aqueous ex-tracts of agriculture/vegetables/plants/ spice based raw materials and liquids/ solutions of foodgrade chemicals and to be used as natural ayurvedic herbal food: ingredients.

For more details, contact

Sarvaiya Chemicals Industries Pvt. Ltd.
C/3, Delite Palace, 1st Flr.
M.G. Rd., Ghatkopar (W)
Mumbai - 400 086
Tel: 022-5114968, 5128114
Fax: 5148450, 5157529
Email: sarvaiya@bom5.vsnl.net.in

LIDDING FOILS

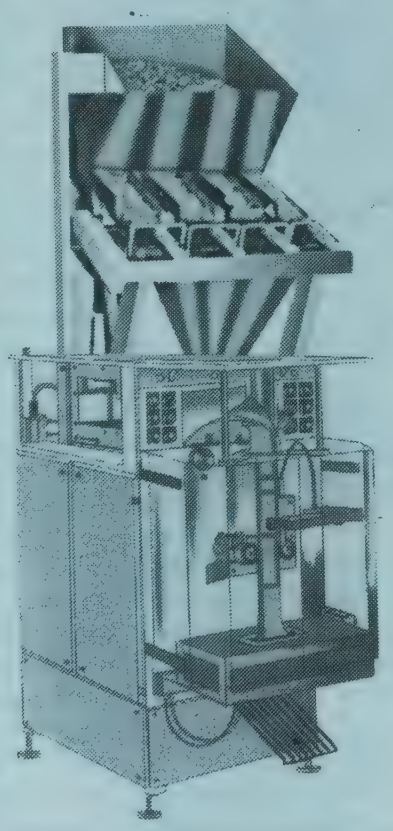
Eskay Flexible Packaging Industries manufacture high quality printed alu-minium lidding foils. Their range of prod-ucts include various foils for HDPE, PET, HIPS containers, for packing of edible oils, ghee, shrikhand, tea, spices, glucose, etc.

The company also offers hologram foils and portable foil sealers.

For your requirements, contact:

Eskay Flexible Packaging Industries Pvt. Ltd.
11, 212, Daulat Udyog Bhavan
Wadhavli Village Rd.,
Chembur, Mumbai 400 074
Tel: 5580996, Fax: 91-22-5500125
Email: eskay_15@vsnl.com
eskayflex@yahoo.com

FORM-FILL-SEAL MACHINE



The form- fill-seal machine from Unique Flexo forms, fills and seals the package from the reel. The result is a sachet so tightly sealed that it keeps food or pharmaceutical products fresh maintaining its sterility. The separation of individual sachets can be reached either by a knife system or by a hotwire cut off system. All contact parts of the machine are of S.S. 304 grade.

This machine can be used for packing various products such as Milk, Juices, Tea, Coffee, Pesticides, Detergents, Oil, Medicines, Chemicals etc...

Salient features:

* Packs 15 gms to 1 Kg of powders and granules and upto 1 litres for liquids * Basic machine can be mounted with powder, granule or liquid filler * Automatic Batch Coding & Date of packing device provided * Speeds up to 45 pouches per minute per track * Available in Single and Double track models* Handles all types of heat sealable films * Optional photocell registration unit.

For more details, contact:

Unique Flexo Packaging
Gala No. B270, Off Manpada Rd,
Opp. Kasturi Plaza, Joshiwada
Dombivli (E) - 421 201
Email: unipack_2@hotmail.com

REFRIGERATION/AIR CONDITIONING SYSTEMS

United Engineering Services design and supply Refrigeration & Airconditioning Sys-tems and Cold Store Equipment. Their spe-ciality includes custom-designed applica-tion oriented Systems, for industrial envi-ronment.

Their products are easy to service, and they offer personalized, efficient, after sales service.

For more details, contact:

United Engineering Services
34 Mittal Industrial Estate, Bldg. No.1
Marol Naka, Mumbai 400 059
Tel: 022-8518233, 8505072
Fax: 022-8505072
Email: s_gokhal@vsnl.com

WOVEN AND NON-WOVEN FILTER BAGS

N.K. Filter Fabrics Pvt. Ltd. incorporated in India are manufacturing Filter Bags for Liquid Solid Separation/Dust Collection out of various Filter media selected to be funtionally suitable.

They offer a wide range of Filters and focus on customer satisfaction through quality product and services. They are well equipped with latest technology of manufacturing with R&D facilities, to meet the customers requirement.

Industries served: • Cement • Chemicals • Pharmaceuticals and Food Industries • Dyes, Paints and Printing Inks • Metal Industries • Vegetable Oil Industries • Petrochemical and Lubricating Oil Industries • Other Industries where liquid solid separation and dust controls are necessary.

N.K. Filter Fabrics has several technical finishes and treatments that are suitable for woven and non-woven filter media to improve material characteristics such as Acid Resistant, Anti Adhesive, Antistatic, Fire Retardent, Water Repellent.

For further details, contact:

N.K. Filter Fabrics Pvt. Ltd.
231/232, Hiranandani Indl. Estate
Kanjurmarg (W), Mumbai 400 078
Tel: 91-22-5786870, 5786927, 5794161
Fax: 91-22-5784400
Email: nkffpltd@bom5.vsnl.net.in
Website: www.nkfilterfabrics.com

PELLET SNACKS EXTRUSION

The continuous evolution of pellets has led to successive modifications and adaptations of the original cooking technology separated from the forming. The flat shapes, the double sheet ones, the holed shapes are some of the evolutional stages of the shape of the snack pellet, together with modifications to the texture and composition of the product. The evolution of technology brings Pavan to propose different types of combinations today to obtain all types of shapes: from those cut on die, with cooking technologies separated from forming and those laminated in double sheet where an extruder-cooker properly equipped directly forms a sheet which is them conditioned, grooved and cut by a rolling forming machine. In this product group obtained from a sheet, the potato based ones occupy a top position. Thanks to a particular type of raw materials they don't require any cooking, so only a forming extruder is used able to recycle directly and continuously the scraps produced from the oval or round shaped cuttings. The flexibility of the development of new shape and formulation shapes and the long experience in the sector allow the Mapimpianti Division to impose new technological and mechanical choises even in sectors close to pellet snacks like humid fried products, like humid fried products (without drying), precooked flours and breakfast cereals. The semi-manufactured phase then permits very significant production rationalization: the same product can be manufactured for a week, then stored and then taken out again to be finished as the market demands the product. Anagolously, in those countries where it is difficult to obtain suitable packaging materials, the semi-manufactured products can be distributed to peripheral plants which are also equipped, which can see to expanding the quantity of the product which is demanded in the short term, packaging it in packages able to ensure a minimum shelf life.

For your requirements, contact:

Valley Pulses Pvt. Ltd.
202 Kush, Veera Desai Road
Andheri (W)
Mumbai 400 053
Tel: 634 0713, Fax: 634 9048
Email: foods11@hotmail.com

SOY FLOUR

Rasoya Proteins manufactures and markets full-fat Soya Flour used for making bread. Soya Flour increases the volume of the dough and size of the bread. The soya flour is economical as 10 to 15% less shortening is required.

They also manufacture and supply Defatted soya flour, toasted & untoasted, used in manufacture of biscuits, cakes and pastries. This defatted Soya flour increases nutrition value. The flour is available in 40 kgs and 50 kgs bags.

For more details, contact:

Rasoya Proteins Ltd.
3rd Floor, Sharda Theatre Building
Dadar (E)
Mumbai 400 014
Tel: 4132322/5382,,Fax: 4150092
Email: rasoya14@vsnl.com

CARAMEL COLOUR

Caramel Colour has been used for generations to improve the taste and appearance of foods and beverages. Imparting colour ranging from delicate yellow to the darkest browns, it remains a versatile and cost efficient colouring agent.

This unique colour is brought to you by Sayaji Sethness Ltd. a joint venture company promoted by Sayaji Industries Ltd. (Ahmedabad) and Sethness Products Co. (U.S.A.) to manufacture Caramel Colours. Sethness Products Company is a dedicated caramel manufacturer since 1880. Today they have developed and standardized the manufacturing process to obtain a product that meets the highest standards. Their rich experience combined with their R&D back-up is available to bring to you the best product available to meet possible range of colour, strength and hue.

Caramel Colours find application in soft drinks, beverages, blended whisky, wines, brandy, vermouth. Also in bakery products, sauces, condiments, preserves, gravies. Besides these, Caramel Colour is used in cocoa/chocolate. textured protein, candy/licorice, vinegars, dairy products, cereals and soups.

For more details, contact:

Sayaji Sethness Ltd.
17/18 GCMM, Odhav
Ahmedabad 382410
Tel: (079) 2875100, 2876000
Fax: (079) 2871338
Email: ssl@maizeproducts.com

OZONE GENERATORS

'Aqua Zone' manufacture state of the art Ozone. Generators for Mineral Water Plants, Ultra Pure & High Purity Water Systems for Pharmaceutical & Electronic Industries & Swimming Pool Filtration Plants.

Some of the salient Features & Specfications are as follows: • Fine injection of ozone into water due to venturi principle. No Compressor required to inject the same into the pipe. The same is done by differential pressure across the injector • Digital AV Meter to show % of ozone produce and % of load • Ozone flow meter to show ozone flow & Time Totalizer • Minimum power consumption • Absolutely no moving parts in the unit hence minimum break down • The unit is made in India with the least imports hence the units are cost effective and suitable to Indian atmospheric conditions • The venturi is made of SS 316 that is Ozone resistant. Any other material of construction gives way to ozone after some time. • In built Air preparation Unit. • Optional SS 304 Cabinet, On-Line ORP monitor.

They also manufacture Plants for water and waste water treatment.

For more details, contact:

Aqua Zone Systems & Engineering
48-52, Cellar-Shalimar Complex
Mahalaxmi Cross Roads
Paldi, Ahmedabad - 380007
Tel: 661 2574
Email: aquazone@icenet.net
Website: www.ozoneworld.com

POWDER FILLING MACHINE

Jet Pack make Automatic Powder filling Machine JPF-60 which is a high speed Twin Head Powder filling machine.

The machine finds applications in various industries like, Food, Tea, Coffee, Spices, Chilly, Turmeric, Cocoa, Milk Powder, Seeds, Detergent powders, Pharmaceuticals, Chemicals, Cosmetics, Tooth powder etc. The machine runs at speeds upto 70 fills per minute depending on the quantity of fill, and can handle jars/containers of different shapes and sizes. A rotating disc during the entire operation handles the containers. Unlike the linear filling this machine saves space and increases the speed of the operation.

The company also manufactures Single head and Semi Automatic Powder Fillers for low production applications.

They also manufacture:

- Semi Automatic & Automatic Cream/Paste filling machines
- Automatic Capping and Cap Pressing Machine.
- Automatic Aluminium/Paper polyp Foil Sealing/Pasting machine.
- Automatic Candy/Biscuit Flow Wrapping Machine.
- Automatic Biscuit and Cartons Over Wrapping Machine.

For further information, contact:

Jet Pack Machines
C-18, Nand Jyot Indl. Est.
Safed Pool, Andheri Kurla Road
Saki Naka, Mumbai 400 072
Tel: 022-8516489/8515561
Fax: 022-8516489
Email: pragsm@vsnl.com

FOOD CHEMICALS

S.A. Chemicals with a global vision in mind has been surging ahead at an impressive speed to service the ever increasing needs of its customers. Qualified promoters, professional marketing team, emphasis on quality, effective after-sales service, timely and prompt dispatches and cost effectiveness are the company's trademarks.

Sorbitol, available in abundance from fruit like black grapes, apples, plums, cherries, pears, finds application in foods and beverages such as Candies, Drinks, Cereals & Snacks etc.

Dextose, a monosaccharides sugar finds application in food and beverages like jams, jellies, icrecream, chewing gums, meat, beer etc.

Liquid Glucose known as Glucose or Corn Syrup finds application in Confectionery, Bakery products, Ice Creams, etc.

Malto Dextrin (Spray dried) used in infant food/feed supplements, beverages, bakery and snack foods, dairy, confectionery, dry mixes, sauces and salads, is a spray dried product.

Other corn based products and modified starches are: Refined Corn Oil, Maize Gluten, Corn Steep Liquor, Dextrin, Oxidized Starch, Starch Ester.

Besides the above, S.A. Chemicals supply Casein, Folic Acid, Sodium Hydrosulphite, Calcium Carbonate, Lactose, Ascorbyl Palmitate, Calcium Gluconate, Whey Protein Dairy Blends, Distilled Monoglycerides.

For more details, contact:

S.A. Chemicals
220 Udyog Bhavan
Sonawalla Road
Goregaon (E)
Mumbai - 400 063
Tel: 8764700
Fax: (022)8769532
Email: sac@sachemicals.com

SAUCES/PASTA/HERBS/FOODSTUFF

Rupande Food Products import a variety of food product such as Chinese and continental sauces, different types of Pasta from Italy, different varieties of Herbs from France, Green, Stuffed & Black Olives from Spain, Pitted Prunes from California and Coconut Milk Powder from Philippines. They manufacture Red Paprika Flakes and Powder, White and Black Pepper whole or in powdered form. They also supply various Dehydrated products.

For your requirements, contact:

Rupande Food Products
52, Shivajinagar, N.M. Joshi Marg
Lower Parel (E)
Mumbai 400 013
Tel: 3003310
Fax: 3060357
Email: rupande@vsnl.net.in

HIGH PRESSURE CRATE WASHER

Goma high pressure crate washer has been successfully working in various industries. The crates/trays are washed thoroughly by high pressure water jet only. There is no requirement of steam, detergent, chemicals etc. The machine is more compact and with minimum maintenance.

The crates/trays are conveyed automatically by conveyor chain fitted on stainless steel fabricated frame. The crates/trays pass through high pressure water jet nozzles having accurate spray angle for washing. The high pressure is generated by a high pressure pump driven through electric motor and mounted close to conveyor. The speed of conveyor is variable and can be adjusted to get optimum washing effect. The washing process is being made inside the stainless steel fabricated enclosure which prevents all egress of water. The enclosure has a provision for easily openable doors for maintenance purposes. Waste water is collected in a sump which can be connected either to the sewage system or can be reused passing through the special filtration system. The whole machine is provided with adjustable feet for levelling and needs no fixing to the floor. A separate electrical control panel is being provided.

Advantages: • Fully automatic • Ensures optimum cleaning in the fastest possible time • Compact design for space saving • Time and man power saving • No need of steam, chemicals, detergents etc. • Low power consumption • Easy for operating and maintenance

For further details, contact:

Goma Engineering Pvt. Ltd.
Behind Universal Petrol Pump
Majiwada, Thana - 400602
Tel: 91-22 5340875/1438
Fax: 91-22 533 3634/2
Email: goma@bom3.vsnl.net.in
Website: www.gomaengg.com

GUMS

Ace International are manufacturers of Gums such as Gum Accacia in powder and crystal form used for mucilage, coating Excipient for Tablets, Emulsifier, Thickener, Collodial Stabilizers & Flavour Stability. Gum Guar which is used as disintegrating Agent in Tablet formulation and binding as thickening agent, suspension stabilizer, film forming Jelly forming as Flocculant. Gum Tragacanth is a stabilizer, Thickener, Texturizer and Emulsifier Gum Ghatti an Emulsifying Agent. All the gums are readily available and have passed microbial test.

For your requirements, contact:

Ace International
13/21 Laura Building, 1st Floor
Office No. 58,1st Dhobi Talao Lane
Mumbai 400 002
Tel: 200 1413, 200 8169 (R) 3872409
Fax: 91-22-2093240
Email: aceindia@bol.net.in

FOOD MACHINES

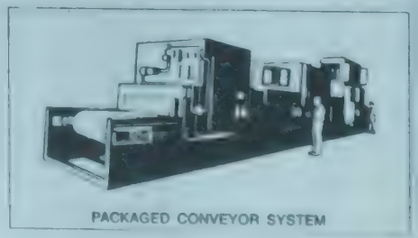
Shirsat Electronics manufacture a range of food machines such as Ovens, Dryers, Fryers, Boilers in electric, LPG, diesel, steam. These machines are custom built standard machines.

Their Roasting Oven is employed for roasting of spices and green leaf teas. The output obtained depends upon the spread, type of material, amount of moisture in the material and in the atmospheric temperature, level of roasting required.

The product is conveyored on three stainless steel bands having variable speed drive, and inverted at every fall on conveyor through the hopper insertion for toasting and drying all sides.

The Roasting Oven employs infra red with adjustable intensity (or) Hot air LPG / LDO, which dries the products directly.

Other products from Shirsat are package conveyor systems, shown below



PACKAGED CONVEYOR SYSTEM

For more details, contact:

Shirsat Electronics
133, Dewan Ind. Estate
No. 6 Navghar
Vasai Rd. (E) - 401210
Tel: (0250)-912-338946
Tele/Fax: (0250)-912-340793
Email: sakav@technologist.com

WEIGH- FILL MACHINES

Kaizen Enterprises offer *Kaizen Tula* semi-automatic weigh fill machines for packaging tea, coffee, beans, sugar grains, farsans, wafers, oilseeds, pulses, dryfruit, etc.

The microprocessor weigh controller is used for accurate weigh controlling along with loadcells and electromagnetic vibrator. The filling range is from 50gms - 1kg and 1kg to 5kg. The product hardly needs any maintenance. Twin head and multihead versions are also available.

For more details, contact:

Kaizen Enterprises
A-5, Trupti, G.V. Scheme Rd. #4
Mulund (E), Mumbai 400081
Telefax: 5646873
Email: kaizen@zeenext.com

FOOD PROCESSING MACHINES

Qamar Fabrication Works are specialists in machines such as pulpers, pulper-cum-finishers, retorts, pressure vessels, hemispherical dairy equipment, storage tanks, agitators and condensors, kitchen equipment, sterilizers.

For your requirements, contact:

Qamar Fabrication
17, Shiv Shakti Industrial Estate
Kurla Andheri Road
Andheri (E), Mumbai 400 059
Tel: 8508871, 8594074, Fax: 8329259

For Attention Of

BAKERIES

Use our FULL FAT SOYA FLOUR for making bread. It increases dough volume and size of the bread, also reduces the requirement of shortening. 10% to 15% cost economy achieved.

We also manufacture Defatted Soy Flour (toasted and untoasted). This can be used in Biscuits, Pastries and Cakes manufacturing to increase the nutritious value. Available in bags of 40 kg & 50 kg each.

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Email: rasoya14@vsnl.com

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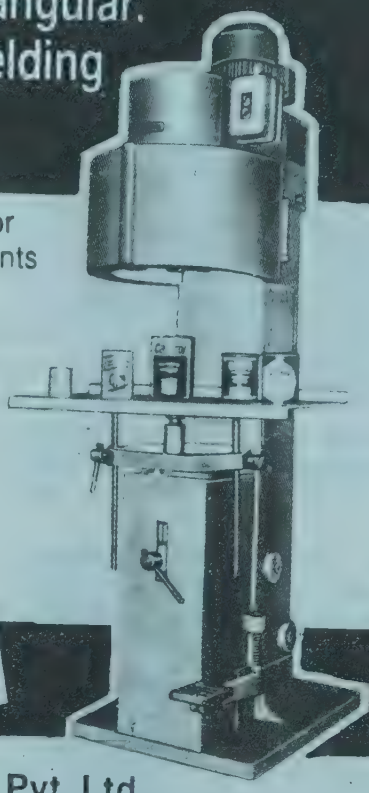

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Email: ganga@bom4.vsnl.net.in • URL: http://www.gangaengg.com

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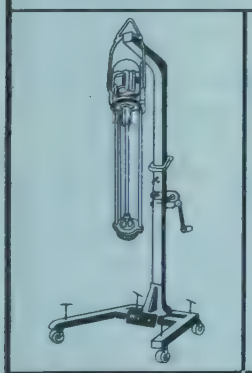
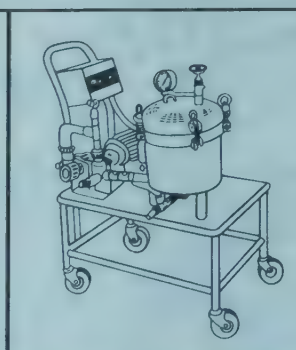
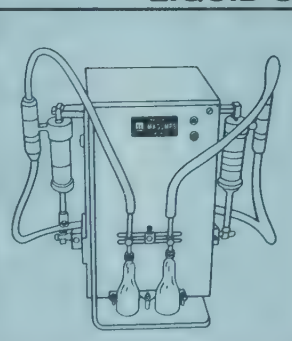
LIQUID SECTION



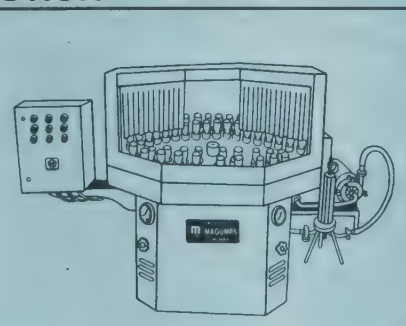
HOMOGINIZERS



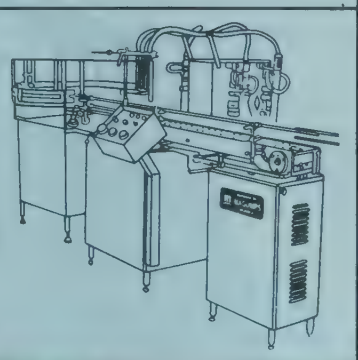
FILTER PRESS



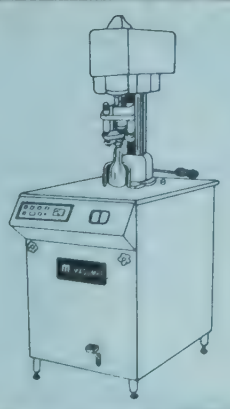
SEMI AUTOMATIC LIQUID FILLING MACHINE



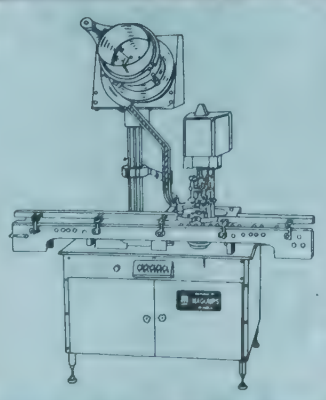
ROTARY BOTTLE WASHING MACHINE



AUTOMATIC LIQUID FILLING MACHINE

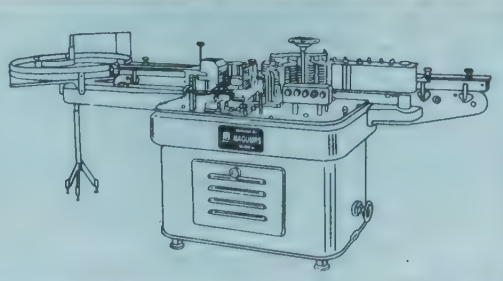


SEMI AUTOMATIC R.O.P.P. CAPPING MACHINE

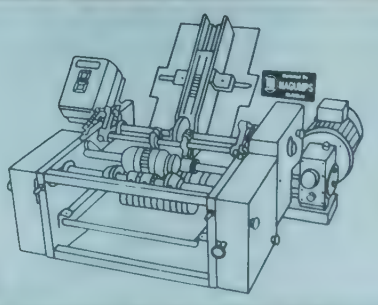


AUTOMATIC R.O.P.P. CAPPING MACHINE

Exclusive machines of High Technology and Precision Quality



AUTOMATIC LABELLING MACHINE



SEMI AUTOMATIC LABELLING MACHINE

MAGUMPS

OFFICE :TRISANDHYA 'A', 97, D. PHALKE RD., DADAR (E), MUMBAI - 400 014.

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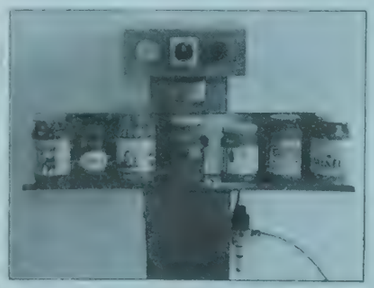

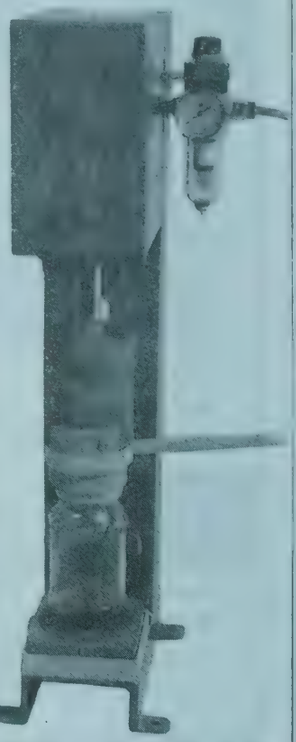

* The modern way to hermetically seal bottled products with Twist-off / vacuseal / Swage Seal Lug Caps to preserve taste and flavour.
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Eliminates firm holding of glass bottles during capping operation, thus avoiding cut-wound in the event of bottle breaking.

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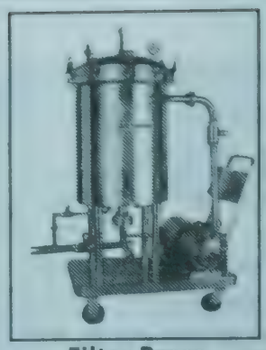
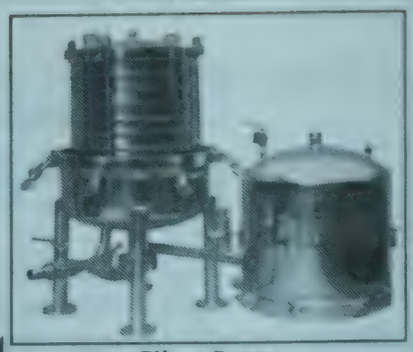
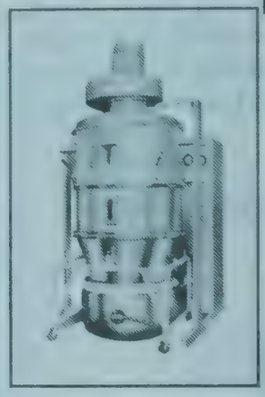
Tel: 8162250 / 8162750, Fax: 91-22-8162750
email: foramfod@bom5.vsnl.net.in



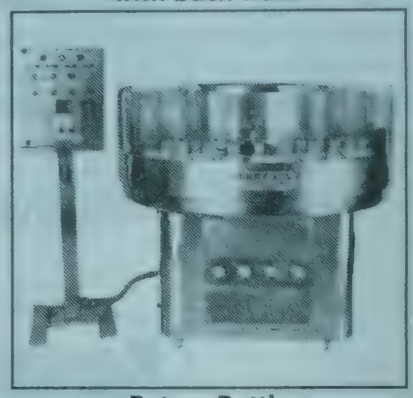
Filter Press
standard model
with back wash



Filter Press
Zero hold up (Reverse flow)
with back wash



Fluid Bed Dryer



Rotary Bottle
Washing M/c.

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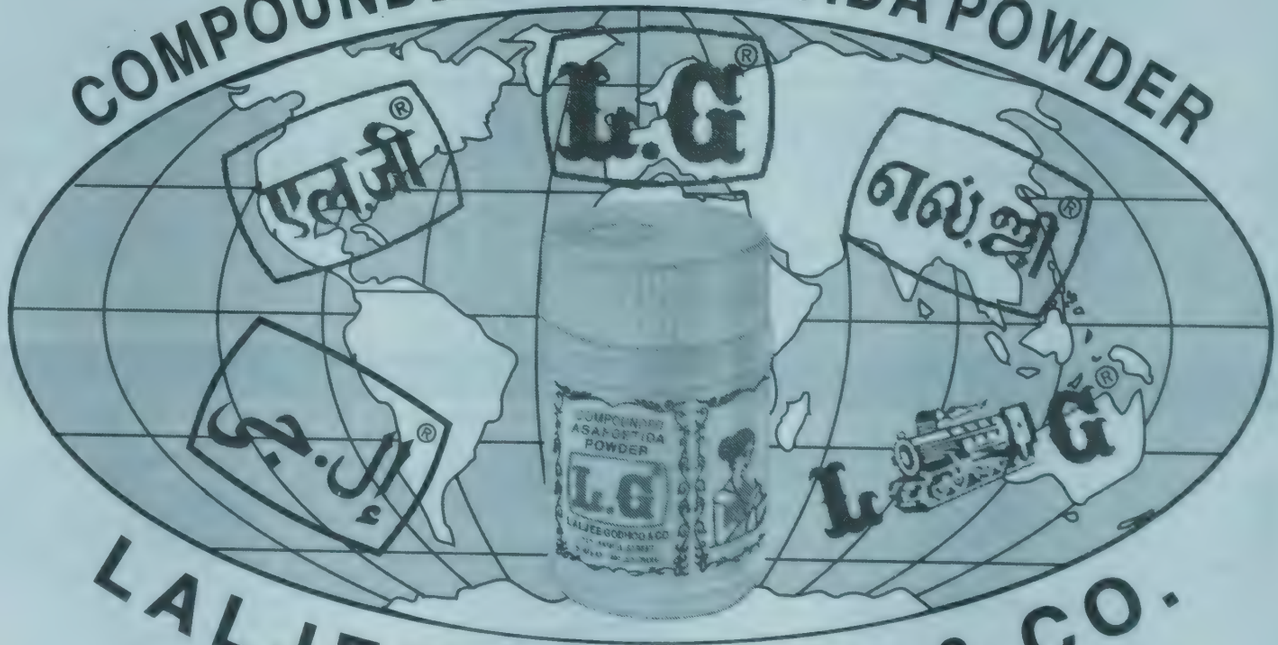
E-mail : chandrakant@kotharipharma.com Website : www.kotharipharma.com
Offices : Ahmedabad, Bangalore, Delhi, Hyderabad, Indore, Bangladesh.

COMPOUNDED ASAFOETIDA POWDER



LALJEE GODHOO & CO.

213, SAMUEL STREET, MUMBAI - 400 003 (INDIA)
TEL : 342 1379, 344 5812 FAX : 91-22-3401742

INSTANT FOOD MIXES

In this age of internet and cyber space with so much of constructive work to do and time being the key factor, the right solution for all needs is KAMATH'S series of instant food.

KAMATH'S™ have brough four yummy delicacies in an instant mix package - made instantly. All that is to be done is, add water and put it on the gas stove and boil the mix. These instant mixes are:

* Udupi Upma * Sweet Sheera * Matki Misal * Onion Pakora * Methi Pakora * Mungdal Pakora.

The age of instant mix, and instant mixes have been around for decades. But there is a difference with KAMATH'S™ instant mix. All the other instant mixes concentrate on technology, KAMATH'S™ concentrate on taste.

KAMATH'S™ plan to add 15 other varieties to instant mixes. Some of these will include soup mixes from tomato sweet and sour, tomato protein, rasam soup, kokum curry. The non-soup varieties will include methi pakora, mung-dal pakora, tomato omelet, onion uthapa, instant sambhar and rava dosa.

KAMATH'S™ instant mixes are being brought to you by Vital Neutraceuticals Private Limited, a company run by the people in the hotel business for the last many decades.

Septuagenarian Vithal Kamath started the Visvaswan Biopharma about 20 years ago manufacturing protein and protein hydrolysate. In 1994, the company launched its food division, and since then it has constantly innovated by introducing different varieties of products. The products are available at all Apna Bazar Departmental Stores.

For more information, contact:

Mr. Ganesh Kamath
Vital Neutraceuticals Pvt. Ltd.
Plot No. D-39, Addl. Ambernath MIDC
Ambernath - 421506, Dist. Thane
Tel/Fax: 0251-681169
Email: vnpllfood@hotmail.com

PROCESS REFRIGERATION

Industrial Refrigeration Pvt. Ltd. (IRPL) offers complete process refrigeration (particularly food processing) solutions under the engineering expertise of Jackstone (formerly APV) - World leaders in Freezing Technology. IRPL offers complete food processing plants and ultra modern cold storages on near-turnkey basis.

IRPL handles projects ranging form supply of equipment to near turnkey contracts including design, procurement of plant and materials, delivery to site, installation, commissioning sales and spares service throughout the country.

They have a tradition of committed and sincere after-sales services. In addition to providing systems for the sea food, dairy, beverage and food industries, they can also contribute in the chemical, plastics and pharmaceuticals industries.

IRPL was formed in 1974 and is a part of 40 year old Allstate Group also involved in Transformer and Bowling Alley Equipment.

IRPL represents: **i) Jackstone Food System** – Plate Freezers, IQF's (Individual Quick Freezers), Freezing Tunnels **ii) Frigo France S.A.** – Ice Flake Machines **iii) Refrigeration S.P.A.** – Puf Panels for Cold Stores **iv) Innovative Freezing System** – Wax Moulders

In addition, IRPL offers Mono Block Refrigeration Equipments for Cold Rooms, Walk-in Coolers, Block Ice Machines, Refrigeration Equipment for Trawlers and Fishing Complexes and Turnkey refrigeration plants for Aquaculture, Fruits and Vegetables Processing Industries.

Industrial Refrigeration is also at the forefront of promoting and supplying systems working on environmentally friendly non-ozone depleting refrigerants.

For further details, contact:

Industrial Refrigeration Pvt. Ltd.
901, Maker Chambers V
Nariman Point
Mumbai 400 021
Tel: 204 1183 • Fax: 91-22-204 4944
Email: allstate@hathway.com
allstate@ 123india.com
Website: http://imcnet.org/home/inco

FILTER PRESS

The SEPRA Plate and Frame type Filter Press from Parksan Filters Pvt. Ltd. meets all specifications of the critical filtration process, and has applications in Pharmaceutical, Brewery and Soft drinks industries.

Parksan Filters Pvt. Ltd. have a wide product range of S.S. 304/SS 316 Filter Presses which include:

• **Ring Pack:** S.S. Candle Filter Unit • **Sepra:** Plate and Frame Type Filter Press • **Liquitech:** Horizontal Pressure Plate Filter • **Panier:** Bag Filter System • **Cartfil:** Cartridge Filter System • **Vessel:** Fermentor/Reactor Vessels • **Pifit**: Pipe Fittings • **Pumps:** Mono Block Design - Centrifugal.

For more details, contact:

Parksan Filters Pvt. Ltd.
3 Saraswati Indl. Estate
Navghar, Vasai Rd. (E)
Dist. Thane 401210
Tel: (0250) 338413
Fax:(022) 8995838
Email: parksan@bom5.vsnl.net.in

CORRUGATED TUBE HEAT EXCHANGE

ECOFLUX corrugated Tube Heat Exchangers have been introduced by Praj Industries of Pune. These are specially designed to meet the hygienic requirements in fruit processing applications like fruit pulps, purees, juices and slices.

Corrugated patterns on the tubes offer better heat transfer co-efficient and uniform temperature distribution, thereby maintaining the consistency and quality of the end product.

The ECOFLUX Exchangers offer significant advantages over conventional methods i.e. • Compact sizes, saves on space • longer running time, as the turbulent flow reduces fouling • ease of inspection and cleaning ensures lower downtime • low product hold-up • high response to CIP which reduce changes of product contamination • shorter residence time • no moving parts, hence lower energy consumption • double, triple or multi-tube construction for different applications.

For further details, contact:

Praj Industries
Praj House
Bavdhan
Pune - 411 021
Tel: +91 20 5884214 / 5884311
Fax: +91 20 5884218 / 5885215
Email: info@praj.net
Website: www.praj.net

RICE MACHINERY

Friends Rice Machinery Manufacture, Old Gaushalla, O/S Chatiwind Gate Amritsar (PB) is a leading company, who have been manufacturing rice processing machinery since 1970. They has manufactured a Rice Shining Machine (Silky Rice), double stages in 1991. So far they have manufactured approximately 300 Rice Shining Machines and installed them in various parts of the country and abroad specifically in Punjab, Haryana, Delhi, Uttar Pradesh, Madhya Pradesh, Assam, Bengal, Madras, Maharashtra, Gujarat, Andhra Pradesh, Karnataka, UK, Hungary, UAE, Bangladesh etc. These machines are functioning smoothly and appreciated by the rice millers.

Rice Whitening Machine

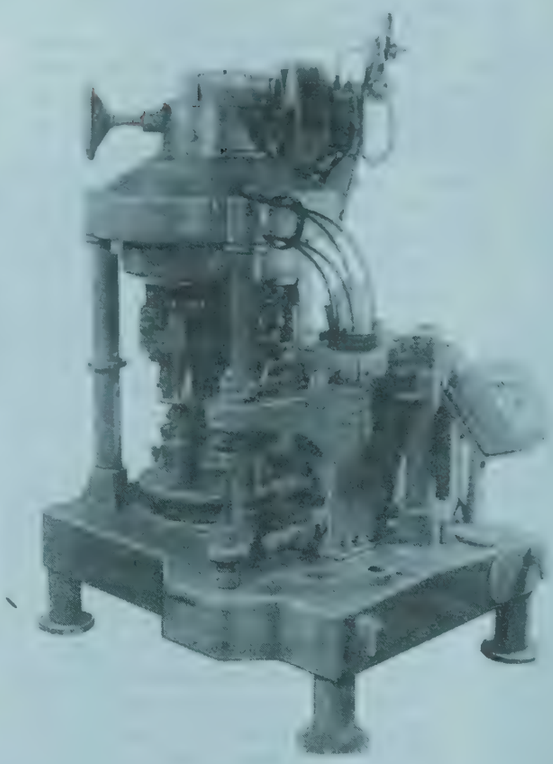
In 1998 they manufactured another design of this machine Model GSM-40 in single stage with capacity of 2 ton Rice P/H, which compared well with that of STAKE (Japan). They have installed nearly 150 machines in the various rice mills of the country which are also functioning satisfactorily. In addition to rice shinning machine, they manufacture the following machinery since 1991 • Rice Graders • Rice Cleaners (Precision Sizers) • Rice Polisher (Rice Whitening Machine) • Paddy Separator, variable strokes • De-Stoner (Rice and Paddy) • Modern Pre-cleaner • Paddy Husker (Pneumatic control) • Rotary Shifter.

The area required for installation of Rice Shining Machine (Silky Rice) is 10' x 10' x 16'.

For your requirements, contact:

Guru Nanak Engg & Foundry Works
166, Industrial Focal Point
Mehta Road, Amritsar
Tel: 0183-583542 (O): 0183-587943
Telefax: 0183-587944
Email: sharanji@jla.vsnl.net.in
Webpage: www.rice_ind.com/friends

MULTIHEAD AUTOMATIC SEAMER



Recon has developed a fully automatic multihead (4 head) Seaming Machine model RSM-4 which is a high speed machine for round cans, dia range 52-105mm, ht range 50-150 mm with an out put of 150-200 cans/minute. The machine is ideal for powder & liquid filled cans such as processed food, edible oil,lube oil, pesticides etc.

The machine is provided with change parts for one size of can in the above dia range, Can feeding and end feeding fully automatic, No Can - No End, machine stop device, Easy change over from one size of can to another. Electronic sensors and control system provided.-

For further details, contact:

Recon MachinesTools Pvt. Ltd.
37 Sarvodaya Industrial Estate
Mahakali Caves Road
Andheri (E)
Mumbai - 400 093
Tel: 0091 22 8343931/8344973
Fax: 0091 22 8361074
Email: recon@bom3.vsnl.net.in
Website: http://www.reconmachine.com

PROJECT CONSULTANCY/MACHINES

Dr. TK Food Consultants Pvt. Ltd., as the name suggests, has been providing Expert Project Consultancy Services for over fifteen years in Dairy, Pasta (Vermicelli, Instant Pasta, Macaroni, Spaghetti etc.) Snack Foods (Pellet Snacks, Expanded Snacks, Potato Chips, Wafers, Laminated or Fabricated Chips, Farsan, etc. We also help clients to set up projects in the foods processing industry.

Pasta Products: Plants and equipments for short / long cut vermicelli (sevia), macaroni, spaghetti, instant and fresh pasta from **Pavan Mapimpianti, Teresani**, and **Foodmac Spa, Italy**. The company provides plant and machinery for dry pasta, long-cut, short cut and nest shaped, pre-cooked pasta, snacks, breakfast cereals and precooked flours.

Pavan machinery for fresh pasta is suitable for food industries and for medium and large size pasta makers. Pavan operates exclusively in the reconstructed snack area like pellets, which can be fried or expanded to obtain a finished product.

Dusting Flavors: Commercial Creamery is one of the leading manufacturers and suppliers of Dusting Flavours for snack food industry throughout the world. They create the ingredients needed to produce a variety of delicious foods including unique seasoning, blends, dips, dressings, sauces and soups, **Commercial Creamery** has wide range of product lines like cheese powders, dairy powders, snack seasonings like nacho, jalapeno, flavours, cheese chunkettes and many others. Their expertise and on going research in spray dried cheese powder and other dairy powder is unmatched.

Bakery / Biscuits: We help in development of small and large industries to manufacture biscuits, pastry and cakes. We have technology available from England and Italy for various types of Biscuits. There are plants available according to product specifications. The products are broadly based like Cracker biscuits, Cookies, Hard Dough, Sweet Biscuits, Coated biscuits, croissants, puffs, pastries, assorted breads etc. The machines are available in semi automatic and automatic systems.

Dairy: We offer technical assistance for the development of various types of dairy products like milk, cheese, dairy whitener, skimmed milk powder, whole milk powder, cereal foods, energy foods, ice cream mix powder, whey powder etc. We also assist in identification of required plant and machine from Indian and European manufacturers.

Farsans: Alu bhujia is one of the most popular farsan in the Indian market. We offer technical expertise to set up complete lines for manufacturing this product using fresh potato and other starches with the help of extrusion technology. We also help to set up plants for manufacture of other types of farsans like Alu salli, gathia, papadi, boondi, peanuts, cashew nuts, dal, peas, chips, wafers, french fries

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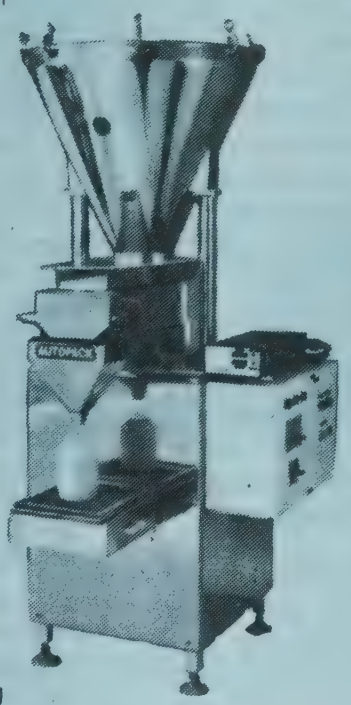
Weighmetric Filling Machi

Model-WF-1

Special Features

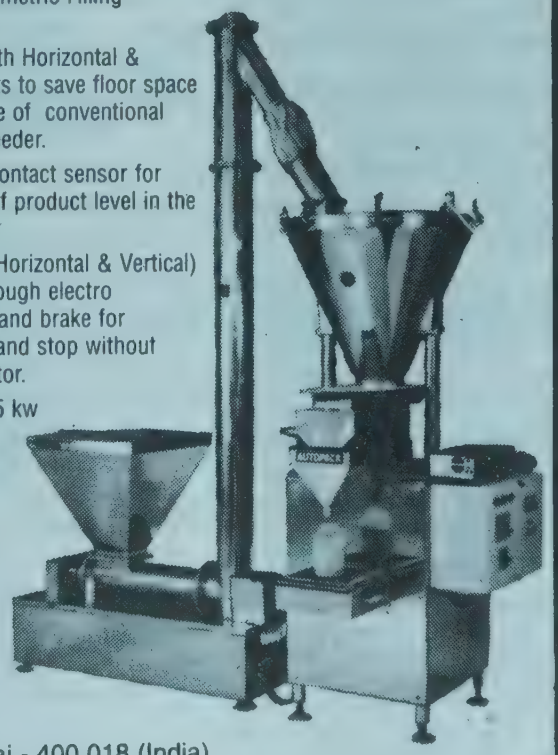
- Dozing Unit for Granules, Free Flowing Powders, Wheat, Rice, Pulses, Peanuts Cashewnuts, sugar, Tea, Coffee Beans, Farsan Cerial Foods, Candies etc. on weight basis.
- Weight controlled by Load-Cell with microprocess programmable system.
- High level of accuracy with the facility of coarse and fine feeds.
- Filling range from 5 gms to 1 kg. Higher capacity models for filling upto 10 kgs.
- Feeding system with electromagnetic linear vibrator.
- Power input : 0.5 k.w.
- Output : upto 2000 fills / hr.
- Special models with multiple filling heads/ automatic handling of containers for higher outputs.



Weighmetric Filling Machine with Screw Feeder

Special Features

- Automatic feeding of product from ground level silo to the charge hopper of Weighmetric Filling Machine.
- Screw Feeder with Horizontal & Vertical Segments to save floor space unlike in the case of conventional inclined screw feeder.
- Electronic Non-contact sensor for precise control of product level in the charge hopper.
- Screw Feeders (Horizontal & Vertical) are operated through electro magnetic clutch and brake for immediate start and stop without affecting the motor.
- Power input : 1.5 kw



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E-312, Crystal Plaza,
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Andheri (W)
Mumbai 400 053
Tel: 022-634 6889 / 90
Fax: 022-634 9048
Email: tkuchroo@bom3.vsnl.net.in
Website: www.drtkfood.com

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Some of the products/on turnkey basis are undertaken by them are oil mills, filteration plants, effluent treatment plants, batch/continuous edible oil refineries, batch/continuous distillation plants, invert sugar.

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For further details, contact:

SharpenTechnologies Pvt. Ltd.
Shanmugananda, D-56 MIDC
Behind London Pilsner, P.O. Box. No. 19
Nerul, Navi Mumbai 400706
Tel: 7907201/2/3/4 7613871
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Vadgadi, Mumbai 400 003
Tel: 3438487
Fax: 3445367 (R): 8647275, 8073565
Email: hopl@bom5.vsnl.net.in

WATER PURIFIER

Alfa Water Purifiers are amongst the leading manufacturers of ultraviolet water purification systems in the country with an experience of over one-decade in the field. They specialise in process water applications where bacterial disinfection of process water, which is used in manufacturing and washing areas, is of utmost importance.

The Alfa AP-Series models are capable of purifying water from 100 to 1,00,000 litres/hour based on customer's specific needs.

The Alfa systems use the principle of Ultraviolet light to purify water without the addition of any chemicals or heat. High intensity germicidal lamps totally inactivate water borne bacteria, viruses and pathogenic micro-organisms.

Alfa water purification systems find wide application where bacteria free water is required and is ideally suited for food industry, hospitals, bottling plants, pharmaceuticals, and drinking water systems and for process water in industries.

The unique advantage of the Alfa UV systems is that they offer an optional **On-Line Fail-Safe validation** with the help of the Alfa Sensor which is an Ultraviolet Monitor to ensure proper disinfection efficiencies, thus making the UV system Reliable and Effective.

They are experts in sizing the customer's requirements and offer professional solutions to bacterial disinfection problems in the process industry using the UV principle.

They have successfully catered to a wide and impressive customer list. That includes firms like Pepsi, Parle, Kwality Biscuits, Naik Sea Foods, Libran Sea Foods, Gausia Foods. Pfizer, Bayer, Johnson & Johnson, Jaslok Hospital, Bombay Hospital etc.

They will be able to provide a suitable solution to your bacterial problems in water if you send them details like feed water quality, quantity of water to be purified per hour and specific application along with a sketch of the piping layout.

For further information, contact:

Alfa Water Purifiers
222, Shah & Nahar A-2
Lower Parel, Mumbai 400 013
Tel: (022) 494 5957, 495 4190
Fax: 91-22-495 4250

DEHYDRATED ONION/GARLIC

Janak Dehydration Pvt. Ltd, was established in 1992 with the dynamic and pioneering zeal of N.L. Mehta with over 50 years of experience in the agricultural business. The company owns hundreds of acres of plantations in Mahuva, Bhavnagar, around its factory, which is located around 800 km from Mumbai.

The major crops being cultivated in their plantations are onions, garlic and other vegetables. All these products are processed and exported to all main European ports including Canada, Latin America, Australia, New Zealand, Japan, Korea, Taiwan, Hong Kong etc.

The company is managed by a professional team specially qualified in the field and having vast agricultural business background. The company has a total business turnover of 4000 MT of fresh onions annualy. The total processing capacity is 6000 kgs of final product per day.

The company has its own warehouses with storage capacity of 5000 MT of raw onions. Janak Dehydration Pvt. Ltd. employs over 500 persons in its premises.

The Dehydrated Onions are available in three colours, white/red/pink - and in different forms like Flakes, Kibbled, Slices, Rings, Mince and Powder.

For further details, contact:

Janak Dehydration Pvt. Ltd.
B-305, Sunder Dham, Ram Baug Lane
Off S.V. Road, Poisar
Borivali (W), Mumbai - 400 092
Tel: +91-22-8061113
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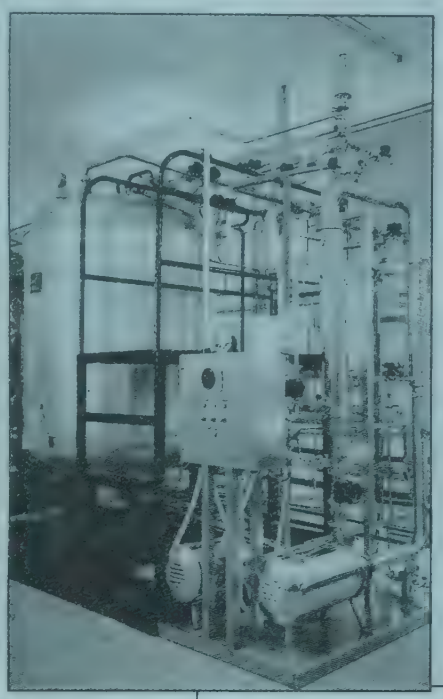

CLARIFICATION
• Fruit Juice • Sugar • Wine
• Saccharified • Vinegar

CONCENTRATION
• Milk • Whey • Fruit Juice
• Sugar • Food Dye • Gelatin
• Pectin

DESALTING
• Milk • Whey • Food Dye

RECOVERY
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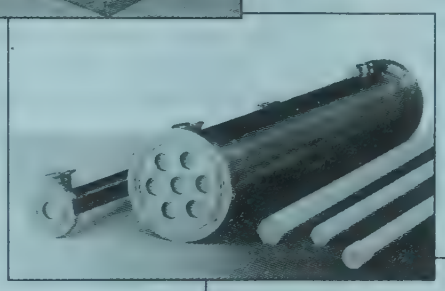
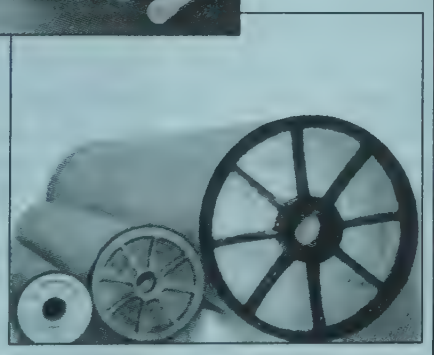
• Caustic from cleaning solution
• Milk from pipeline washing



• **S**urface water treatment

• **E**ffluent treatment Zero discharge



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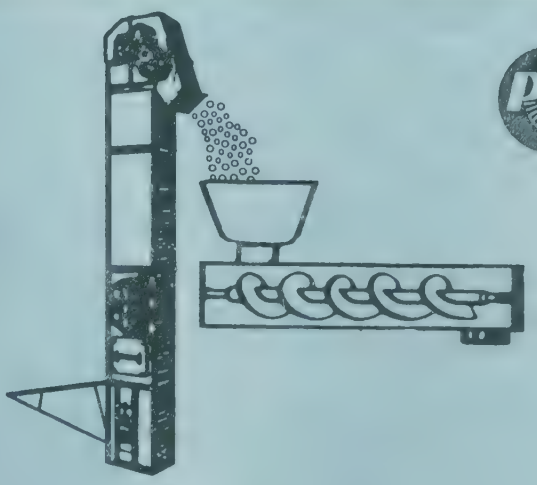
MATERIAL HANDLING EQUIPMENTS



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Email : care_raj@yahoo.com

PACKAGING MACHINES

Indvac range of machines are manufactured by Saurabh Engineers. Some of their products include Vacuum Packaging machines which are available in table top, nitrogen flushing machines for pillow packing of potato wafer in pouches, Shrink wrapping machines in conveyorised Tunnel type models, are their other products.

Impulse/Hotbar Sealers, Special Purpose Long Sealers, Continuous Sealers and Vertical Sealers are also manufactured by Saurabh Engineers.

For further details, contact:

Saurabh Engineers
11, Upvan Co. Op. Hsg. Soc. Ltd.
Off. 132 Ft Ring Road
Ahmedabad 400 051
Tel: (O & R) 6765115, 6760292
(Fact.) 2740288, 2732428
Fax: 91-79-6765115/2740288
Email: indvac@ad1.vsnl.net.in
Website: www.indvac.com

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Fax: 080-3385979

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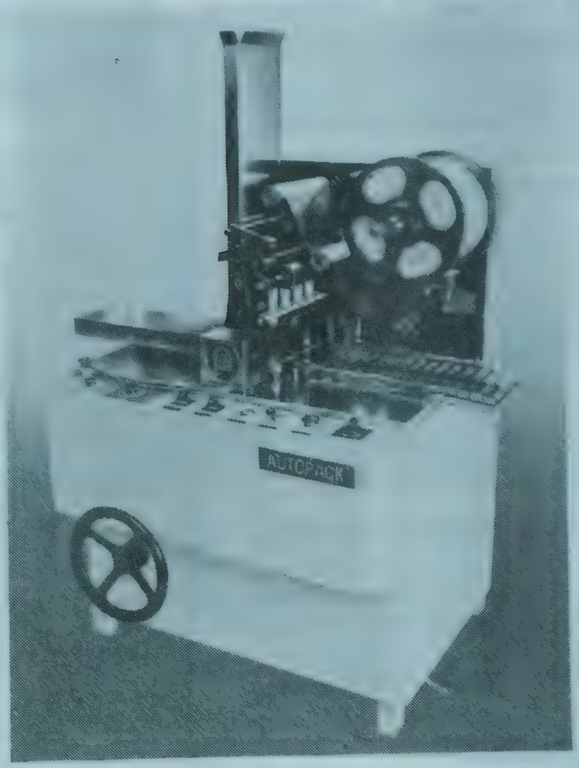
Red Club Flavours Pvt Ltd.
70-A, Rama Road
New Delhi 110 015
Tel: 545 1142, 5431556
Fax: 91-011-5104412

CARTON OVERWRAPPING MACHINE



Autopack's Overwrapping Machine Model AW-120 is fully automatic and is an ideal machine for overwrapping different sizes of rectangular shaped cartons/products such as Tooth Brush Cartons, Agarbatti Cartons, Audio or Video Cassettes, Blade Tucks, Erasers, Pharmaceutical & Food Products in rectangular cartons.

The Cellophane or BOPP Film roll mounted directly on the machine is cut to the required size, the product is wrapped and heat sealed. Gives an output up to 120 units per minute depending upon the size of the cartons/products.

For further details, contact:

Autopack Machines Pvt. Ltd.
101-C, Poonam Chambers
'A' Wing, 1st Floor
Dr. Annie Besant Road
Worli, Mumbai - 400 018
Tel: 4924806, 4974800
Fax: 022-4964926
Email: autopack@bom3.vsnl. net.in

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Direct/Indirect Gas/Oil fired as well as high breed travelling type biscuit baking ovens of most modern design suitable for baking short dough and hard dough biscuits like sweet, salty, marie etc. The ovens have specially designed tray conveyors suitable for baking/drying pan masala & tobacco. The ovens are used all over India and abroad some of their esteemed clients are, Britannia, Parle's, Bakemen's Nutrine, Amo-Tech Bakery in South Africa, Jawa Biscuits (Indonesia) Baba Biscuits and Kwality biscuits in Nepal.

They also manufacture PVC/Crown Caps, Automatic Sheet unloader, Pile Turner and Biscuit manufacturing plant.

For further details, contact:.

Ovenman Industries Pvt. Ltd.
A/1, Veena Beena Apts.
Sewri (W), Mumbai 400 015
Tel: 413 0926, 414 0292, 416 8838
Fax: 413 7339
Email: aifso@bom3.vsnl.net.in
Website: www.aifso.com

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For further details, contact:

Ashok Sales Co. Ltd.
51/53, Nayaganj
Kanpur 208001
Tel: 0512-365677, 356854
Fax: 0512-317611
Email: agukl@lwl.vsnl.net.in

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For further details, contact:

Kushalchand Sons
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For further details, contact:

Kamani Oil Industries (Chawla Bros. Ltd.)
317-Puran Asha Bldg.
Narsi Natha Street
Mumbai 400 009
Tel: 3420241/42/43
Fax: 3435964
Email: kamani@bom2.vsnl.net.in

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For further details, contact:

Britomatics Engineers Pvt. Ltd.
C-9, Nand Dhan Ind. Estate
Marol Maroshi Road
Andheri (E), Mumbai 400 059
Tel: 850 0833, 850 5834
Fax: 850 4999, 850 5334
Email: britomatic@india.com
britomatics@bom5.vsnl.net.in
Website: www.britomatics.com

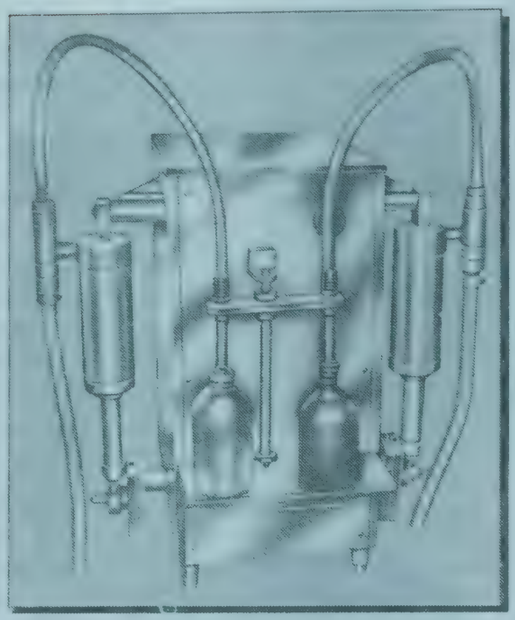
FOOD & BEVERAGE MACHINERY

Chhaya Enterprises are manufactures of Food and Beverage Machinery. The company are specialists in manufacturing, Syringes, Lobe Pumps and Machinery parts. The Colloid Mill and Volumetric Fillers are used by Food and Beverage industry all over the country.

For further details, contact:

Chhaya Enterprise
C-5, Parle Colony
Sahar Road, Vile Parle (E)
Mumbai 400 057
Tel: 8329259 (R) 8205584

BOTTLE FILLING MACHINE



The Bottle Filling Machine below, is Volumetric type, which consists of a drive mechanism of electric motor and reduction gearbox housed in a S.S. cabinet. The drive is transmitted to filling cylinders (syringes), which suck the liquid from tank and dispense in to bottle.

The volume of filling can be set or adjusted as per requirement on the setting block. Three models are available 30 ml, 560 ml and 1 ltr. Out put depends upon product and volume of fill. Usually for all general purpose liquids between 20-30 bottles per minute can be filled. The accuracy of this machine is fantastic and repeatability is a major feature.

It can fill all/any liquids which have a free flow and viscosity like honey also. Some liquids like pesticides, liquid blue etc. create foam during filling. Our machine has a special "Non-Foaming" attachment for these types of liquids.

Twin Head Machines are mainly Semi-Automatic where bottles are replaced by hand, whereas in automatic machines, no human work is required and these machines are also available in 4-6-8-10 heads.

For more details, contact:

Pharmaco Machines
B-2/17, Anubandha
Next to Ramkrishna Math
Sinhagad Road
Pune - 411030
Tel/Fax: 020-4220248
Email: saumitra_65@hotmail.com

OTS CANS

For small canning units, Care Containers Pvt. Ltd. supply No.1 Tall (301), A-2½ (401), and A-10 (603) OTS Cans which can be used for canning of fruit juices, vegetables, butter, mushrooms and dairy products, among others. They also supply specialised lacquered Cans for meat.

For more details, contact:

Care Containers Pvt. Ltd.
A-501, Swiss Palace, Shastri Nagar
Andheri (W)
Mumbai 400 053
Tel: 6360871/6391606
Fax: 8570459
Email: care_raj@yahoo.com

BAKERY EQUIPMENTS

Kovithins are manufacturers of Bakery Equipments like Rotary Rack Oven, Modular Deck Oven, Planetary Cake Mixer, Spiral Dough Kneader and Gravity Feed Bread Slicer. The equipments are strong and durable and extensively used in the country. Kovithins are a name to reckon with in Bakery Industry.

For further details, contact:

Kovithins
21, Nandlal Ramroop Estate
Ramkrishna Mandir Road
Andheri (E)
Mumbai 400059
Tel/Fax: 8230095

FILLERS

A company with over 25 years of experience with design, development, reconditioning, upgrading and refurbishing of Filling Lines with glass, plastic and PET containers is Boncon Engineers Pvt. Ltd. They are expert in trouble shooting in all Bottling machines and Liquid Lines such as soft drinks, beer, mineral water, pharmaceuticals etc. Boncon specialises in Gravity Fillers, Pressure Fillers, Conveyors, Case Packers, Uncasers, Bottle washers, Container Rinsers, Unscramblers and allied machinery.

The company gives high quality Engineering solution to machinery and spare indigenisation for either manufacturing unit ventures or end users with effective preventive maintenance plans. Boncon has extensive experience with Indian, Italian, Germany, English and American machines, both in India and overseas.

For further details, contact:

Boncon Engineers Pvt. Ltd.
247, Shiv Shakti Indl. Estate-III
Andheri (E), Mumbai 400059
Tel: 8501916, Tel/Fax: 850 6381
Email: boncon@bom7.vsnl.net.in

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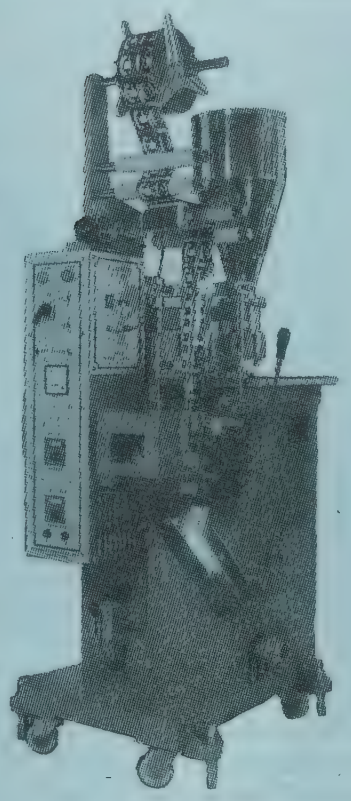
They also manufacture Dryers, Tray, Tunnel Drum and Fluid Bed. The company manufactures Biscuit Bread making Machine, Toffee Hard Boiled Sweet Machine, Chewing Gum making Machine, Boilers, Themopack, Sigma Kneaders, High Speed Mixers, Planetary Mixers and Powder Mixers, Weighing machines.

For further details, contact:

Bombay Industrial Engineers
13, Crystal Apartment
Gulmohar Cross Road
11, J.V.P.D Bombay 400 049
Tel: 6232810
Telefax: 6201914
Email: ijsehgal@bom5.vsnl.net.in

FORM-FILL-SEAL MACHINE



The fully automatic vertical form-fill-seal machine from Gurdeep Packaging finds application for packing any free flowing powder and granules, spices, soup-concentrates, soft drink concentrates, pharmaceutical powder, detergents, tea/coffee, pan masala, supari, confectioneries etc.

Specifications: Sealing Type: 3 sides sealing/4 sides sealing. Packing Size: 50-120mm, or 100-240mm (film length). 20-160 mm, or 20-220 mm (film width). (enlarged type can be made upon order). Speed: 45-90 bags/min, 60-120 bags/min. (Depending on flowing rate and volume on packing objects). Packing Material: All heat sealable laminate PET/POLY, PET/FOIL/POLY MET, PET/POLY/CPP/OPP etc...

For your requirements, contact:

Gurdeep Packaging Machines
Harichand Compound,
L.B.S. Marg,
Vikhroli, Mumbai 400 079.
Tel: 5783521, 5772846, 5795982
Fax: 91-22-5772846

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D.P. Sales Corporation are sole distributors and exporter of instant Coconut milk Powder "Palmo" 3 tablespoon of Palmo coconut milk powder when added to 100ml of Luke warm water gives thick coconut milk, or if 3 tablespoon of Palmo coconut milk powder in 200ml of Luke warm water gives thin milk. Palmo is economical and time saving, it is easy to store with longer shelf-life. It is used in Chicken, Mutton, Fish and Malwani curries, Cream, Sauces, Instant Solkadhi, Ice cream, Biscuits, Coconut milk shake in fruit juice and Pinacolada. Available at all leading stores, super markets and cold storages in Mumbai.

For further details, contact:

D.P. Sales Corporation
Modi & Modi Building No. 2
76, Nagindas Master Road
Fort, Mumbai 400 023
Tel: 2674901, 2670976, 2675724
Fax: 2676435

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The Popcorn Machine from M.M.M. Buxabhoy & Co. has the following features: • Copper bottom vessel ensures even heat and faster heating cycle • Thermostatic control of heater for safety • New look machine with simple and easy operation • Lower power consumption than other machined of comparable size.

For further details, contact:

M.M.M. Buxabhoy & Co.
141-A, Sarang Street
Mumbai 400003
Tel: 3442902/3452532, Fax: 3425230
Email: yusufs@vsnl.com

TUBE FILLING/SEALING MACHINE

Norden of Sweden has developed innovative sealing methods, such as Hot Air Sealing and Design-A-Seal, which enjoys worldwide patent.

Design-A-Seal, as the name suggests, offers 10 different sealing shapes on the tubes to suit individual design needs and is undoubtedly the most aesthetic and strongest seal available in the market.

Design-A-Seal not only increases the shelf appeal of products but also the sales volume as well. The other technical developments are: Servo lifting mechanism, robot feeding systems, CIP-SIP cleaning.

Norden has a range of machines with output of 40, 70, 140, 200 and 300 tubes per minute, depending upon the type of tube and product to be filled. Batch coding facility on tubes is also available.

Reico Industries are the exclusive representatives for Norden in India.

For further details, contact:

Rieco Industries Ltd.
1162 / 2, Behind Observatory
Shivajinagar, Pune 411 005
Tel: 0212 - 5535215, 5535384
Fax: 5533229
Email: package@rieco.com

ULTRAVIOLET WATER DISINFECTION SYSTEM

Ultraviolet Water Disinfection System using the latest US based Teflon® Technology is the ultimate answer to prevent pollution and contamination in water. Disinfection by UV System is excellent – because it achieves near cent percent water purity without any side effects. It is also cost effective and maintenance free. The system can also be used for various industrial applications such as Food and Beverage industries, Breweries, Distilleries, Pharmaceuticals, Chemicals and Laboratories.

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For further details, contact:

Hitech Ultraviolet Pvt. Ltd.
P.O. Box. No. 8356, 35, Grace Plaza
S.V. Road, Jogeshwari (W)
Mumbai 400 102
Tel: 6790610, 6794611, 6794327
Fax: 6794337
Email: hitechuv@bom5.vsnl.net.in

FOOD PROCESSING EQUIPMENT

A wide range of machines/equipment are manufactured by Geeta Food Engineering, such as * Steam Jacketted kettles * Pulper-cum-Finisher * Papaya Cubing Units * Pineapple Slicing Machines * Juice Extractors * Fruit and Vegetable Crushers * Pickle Filling Machines.

Other products manufactured by them are: Bottle washing and filling machines, Exhaust Box, Boiler, SS Top Table & SS Tanks, Vacuum Evaporates Vessels.

For further details, contact:

Geeta Food Engineering
Plot No. C-7/1, TTC Area
Pawana MIDC, Thane-Belapur Road
Navi Mumbai 400 705
Tel: 7906450/51, Tel/Fax: 761 0907

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For further details, contact:

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1 Vishal Ind. Estate
Village Road, Bhandup (W)
Mumbai 400 078
Tel: 5600562, 5690572 (R) 5645287
Fax: 5649312
Email: ganga@bom4.vsnl.net.in
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For further details, contact:

Bharat Potteries Ltd.
B-12, MGD Market
Jaipur 302 002
Tel: 141 312316, Fax: 141 319419
Email: bindia@bharatin.com
Website: www.bharatin.com

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For further details, contact:

Paul Air Engineers
B-26, Nand Jyot Industrial Estate
Safeed Pool, Mumbai 400 072
Tel: 8516401, Fax: 8514525
Email: paulair@vsnl.com

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For further details, contact:

Pump Engineering Co. Pvt. Ltd.
C/38-39, GIDC. Odhav
Ahmedabad 382 415
Tel: 079-2871257, Fax: 079-287 4375
Email: pec_pump@hotmail.com

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For further details, contact:

Maharashtra Traders
207, Oberoi Trade Centre
Oberoi Complex, Off Malad Link Road
Near Laxmi Industrial Estate
Andheri (W), Mumbai 400 053
Tel: 6330974/0976
Fax: 6325871/7941, 344 4164
Email: palani@bom3.vsnl.net.in
URL: palanigroup.com

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To check bacteria in food products, Kakiro Biotech manufacture Bactaslyde which can be used for detecting microbial contamination of all kinds of materials, viz. metal working fluids, process waters, food, soft drinks, etc.

Bactaslyde can be used by anybody as it is extremely easy to use and requires no capital investments. It can be used at site very effectively.

For further details, contact:

Rakiro Biotech
1New Modella Industrial Estate
Padwal Nagar, Wagle Estate
Thane 400 604
Tel: 5836846

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Citric Acid and Calcium Carbonate manufactured by Citurgia Biochemicals Ltd. find application in a wide range of food products and beverages, and are much in demand in the industry.

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Citurgia Biochemicals Ltd.
Neville House, J.N. Heredia Marg
Ballard Street
Mumbai 400 001
Tel: 2618071, 2678047
Fax: 2613519
Email: citurgia@bom5.vsnl.net.in
Website: www.citurgia.com

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ACE INTERNATIONAL, 13/21, Laura Bldg., 1st Flr., Office No. 58, 1st Dhobi Talao Lane, Mumbai 400 002. Tel: 2001413/8169, Fax: 91-22-2093240 Email: aceindia@bol.net.in
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AGUAPURO EQUIPMENT, 2/22, Panwala Building, Dr. S.S. Rao Road, Lalbaug, Mumbai -400 012. Tel: 410 1432 / 415 5576. Fax: (022) 415 5576, Mobile: 98210 78 929, Email: ID-aguapuro@vsnl.com, Website: www.aquapuro.s5.com
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Products: * Ozonators Water and Waste Water Treatment Plants

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B. B. PLASTICS, B-96, Sector-10, Noida 201301. Tel: 011-91-4525097, Mobile: 9810077095 Attn: Mr. D.K. Khanna
Products: Plastic moulded Packing Bottles * Injection moulded Packing Bottles

BANGALORE TEST HOUSE, 65, 20th Main, Marenahalli, Vijay nagar, Bangalore 560 040. Tel: 3356415, 338 8895, Fax: (080) 3385979
Products: * Analytical Chemist for Beverage and Food Products * Cateriny to testing requirements of all food products * grading of food products

BESCO LTD., 13/4, Mathura Road, Faridabad (Haryana). Tel: (0129) 5275338, 5275334, Fax:

Indvac RANGE OF PACKAGING MACHINERIES

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Available in Table top, Single & Double Chamber Trolley & Vertical models

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Optional vacuumising system

Shrink Wrapping Machines

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Other Products:

- Impulse / Hotbar Sealers
- Special Pneumatic long sealers
- Continuous sealers
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SAURABH ENGINEERS

11, Upvan Co. Op. Hsg. Soc. Ltd.,
Off. 132 Ft Ring Road, Ahmedabad-51.
Phone : (O. & R.) 6765115, 6760292
(Fact.) 2740288, 2732428
Fax : 91-79-6765115/2740288
e-mail : indvac@ad1.vsnl.net.in
web-site : www.indvac.com

(0129) 5275337 Email: skmisra20@hotmail.com
Products: Spray Drying Plant for Speciality Ingredients.Also manufacture * Flavours * Food Grade Chemicals * Fruit Powders *Encapsulated Oleoresins etc.

BHARAT POTTERIES LTD., B-12, MGD Market, Jaipur 302002. Tel: (141) 312316, Fax: (141) 319419 Email: bindia@bharatin.com Website: www.bharatin.com
Products: Bone China Potteries and Stoneware/Colouredware

BOMBAY ENGINEERING INDUSTRY, Room No. 6 (Extn.), Sevantibai Bhavan, Chimatpada, Marol Naka, Andheri (E), Mumbai-400059. Tel: 8215795 (R): 821 2071, Tele/Fax: 91-22-836 9368, Email: bommars@bom.7, Website: http://bei.jumbusiness. com
Products: * Automatic and Semi-Automatic (Pneumatic Controlled) Filling & Sealing Machines * Automatic Bagging & Weighing Machines * Pillow Pack Candy Wrapping Machines * Form-Fill-Seal Machines with Bucket Elevators * Horizontal Flow-Pac Wrapping Machines * Vertical Flow Pouch Pack Machines * Automatic Powder Filling Machines * Automatic Weighing Machines * Liquid & Paste Filling Machines *Tube Filling & Sealing Machines *Flow Pack Wrapping Machines for Hard Boiled Candy * Auger Filler Machines * Nett Weight Granules Filler Machines *Volumetric Filler Machines

BOMBAY INDUSTRIAL ENGINEERS, 13, Crystal Apts., Gulmohar Cross Rd. 11, JVPD, Mumbai 400049. Tel: 91-22-6232810/6201914, Email: ijsehgal@bom5.vsnl.in Fax: 6201914
Products: * Food Processing Machinery such as * Pulpers *Juice Extractors * Steam Jacketed Kettles * Fruit Slicers/Crushers *Mango Cutter *Canning Retorts, Hot/Cold Liquid Filling Lines * Bottle Closing Powder Filling, Form-Fill-Sealing Machines * Dryers (Tray, Tunnel, Drum, Fluid Bed) * Biscuit/Bread Making Machinery * Toffee-Hard Boiled Sweet Machinery * Chewing Gum Making Machinery * Cloth Raising Machine * Ovens *Boilers-Thermopacks * Chemical Equip-ment * Sigma Kneaders * High Speed Mixers, Planetary Mixers *Powder Mixers * Weighing Machines *BOPP/Industrial Tapes Manufacturing Machine & Plant

BONCON ENGINEERING PVT. LTD., 247, Shivashristi Industrial Estate III, Andheri (East), Mumbai 400 059. Tel: 8501916/6481, Fax: 8506381 Email: boncon@bom7.vsnl.net.in
Products: * Fillers

BRITOMATICS ENGINEERS PVT. LTD., C-9, NandDham Ind. Est., Marol Maroshi Road, Andheri (E), Mumbai 400059. Tel: 91-22-8500833/8505834, Fax: 8504999/8505334, Email: britomatics@india.com, Website: www.britomatics.com, www. digicatonline.com/britomatics
Products: * Filter Cartriges & Filter Housings to Meet Requirement of Food & Beverage, Pharmaceutical Industry & Biotechnology

BURZIN AND LEONS AGENTUREN PVT LTD., Ready money Bldg. No. 1, Sir Ratan Tata Marg, Tardeo Road, Mumbai 400 034. Tel: 4944616, 4921255, 4953518, Telefax: 4930283, Email: burzin@bom3.vsnl.net.in
Products: * Xantham Gum * Gellan Gum * Sodium Alginate * Alginic Acid * Propylene Glycol Alginate * Potassium Alginate * Dairy Stabilizers / Emulsifiers * Ice Cream Stabilizers

CANTECH MACHINES, 13, Vora Bhuwan, Maheshwari Udyan, Above Dena Bank, Matunga (C.Rly.), Mumbai 400019. Tel: 91-22-4096086, 4096853, Fax: 4096086, Email: dpandya@bom3.vsnl.net.in
Products: * Can Seaming, Reforming, Flanging, Embo-ssing, Testing Equipment and Body Beader of International Standard. Complete Fruit & Vegetable Canning Project on Turnkey Basis. Available Imported High Speed Can Seamers both New and Second Hand Machines and OTS Aluminium Two Piece Canline can be procurred * Liquid Fillers * Metal Box Machines Spares

CARE CONTAINERS PVT. LTD., A-501, Swiss Palace, Shastri Nagar, Andheri (W), Mumbai 400-053. Email: care_raj@yahoo.com Fax: 8570459, Tel: 636 0871 6391606
Products: * OTS Cans for Fruits *Juices * Vegetables * Butter *Mushrooms * Dairy Products *Fish * Specialised Laquered Cans for Meat

CARLSON FILTRATION (INDIA) PVT. LTD., 203, Malwa, Patanwala Estate, L.B.S. Marg, Ghatkoper (W), Mumbai 400 086. Tel: 022-5003400/0344, Fax: 022-5001358, Email: carlsonindia@carlson. co.uk Website: www.carlson.co.uk.
Products: * Filter Pads * Filter Module * Filter Press for Syrups, Edible Oils and Breweries

CHEMBOND CHEMICALS LTD., Chembond Centre, EL-71, Mahape MIDC, Navi Mumbai 400705. Tel: 7618799, Fax: 7681294 Email: chembond@vsnl. net.in
Products: QuatCide 304, non toxic, odourless and non corrosive disinfectant

CHEMISOL ADHESIVES PVT. LTD., 7/10, Botawala Building, 8 Horniman Circle, Mumbai 400 023. Tel: 262 5389 / 5520 / 6354 / 6452, Fax: 262 5610, Email: bom@chemisol.com, Website: http://www.chemisol.com
Products: * Chemistik® - Water Proofing Adhesive and Concrete Protections

CHHAYA ENTERPRISES, C-5, Parle Colony, Sahar Road, Vile Parle (E), Mumbai 400057. Tel: (F): 8329259, 8205584
Products: * Food & Beverage Processing Machinery e.g. * Colloid Mill * Volumetric Filler * Lobe Pumps * Syringes * Machinery Spare Parts

CITURGIA BIOCHEMICALS LTD., Neville House, J.N. Heredia Marg, Ballard Estate, Mumbai 400 00.Tel: 261 8071 Ext. 459/460, Direct - 2678347, Fax: 261 3519 Email: citurgia@bom5.vsnl.net.in Website: www.citurgia.com
Products: * Citric Acid * Calcium Carbonate

CLARICO-FPC (INDIA) PVT. LTD., 601 Gateway Plaza, Hiranandani Garden, Powai, Mumbai 400 076. Tel: 91-22-5704411, Fax: 91-22-5704412, Email: info@clarico_fpc.com
Products: * Dietary Fibre Concentrates such as Wheat Fibre, Powdered Cellulose, Apple/Orange/Tomato Fibre, Oats Fibre, Lupine Protein, Soy Milk Powder

D.P. SALES CORPORATION, Modi & Modi Building No.2, 76, Nagindas Master Road, Fort, Mumbai 400 023. Tel: 2674901/0976/5724, Fax: 2676435
Products: Instant Coconut Milk Powder

DAVARS M.P. ORGANICS, Tansen Road, Gwalior 474002 (M.P.). Tel: 330841 / 326888Fax: 0751-332278 Email: info@davars.com davars@dawars.com
Products: Food Additives Stabilizers * Emulsifiers * Improvers * Ready to use Instant Food Mixes * Pudding mixes * Gulab Jamun mix * Jelly Sweets * Topping Sauces & Syrups

DELAIR (INDIA) PVT. LTD., Delhi: Tel: 391 2800, Fax: 391 5127, Email: delair@pahwa. com, Website: www.delairindia.com
Products: * Compressed Air Flyers

DELTA CORPORATION, 201, Wadala Udyog Bhavan, Naigaum Cross Road, Wadala, Mumbai 400 031. Tel: 4124415, 4128985, Fax: 4144676 Email: delta.cst@gems.vsnl.net.in
Products: IG Series Tushaco Stainless Steel Pumps

DONROMOS PVT. LTD., H.O.: 74 Russell House, 2nd Hasnabad Lane, Opp. Willington Gymkhana, Santacruz (W), Mumbai - 400054 Tel: 6055029/5099/8001, Fax: 605 5027, Email: russellindia@vsnl.com
Products: * Russell Air Curtains

DOSHI ION EXCHANGE AND CHEMICAL INDUSTRIES LTD., 7/87 Kazi Syed Street, Masjid Bandar Mumbai 400 003. Tel: 3443480, 3420696, 3452901, Fax: 3413894
Products: * Water Treatment

DR. TK FOOD CONSULTANTS PVT. LTD., 312E, Crystal Plaza, Lokhandwala Link Road, Andheri (W), Mumbai 400053. Tel: 022-6346889/90, Fax: 022-634 9048, Email: tkuchroo@bom3. vsnl.net.in. Website: www.drtkfood. com
Products: * Pasta Plant and Equipment * Dairy Plant * Snack Food and Farsan Plant * Snack Food Ingredients * Packaging Machines

DRYTECH PROCESSES (I) PVT. LTD., B-16, Girikunj Industrial Estate, Mahakali Caves Rd., Andheri (East), Mumbai 400 093. Tel: 8378915, 8326494, 8301918, 8210401, Fax: 022 8367442, 8242476, Email: drytech@bom8.vsnl.net.in, Website: drytechindia.com
Products: * Spray Dried Food Ingredient such as *Gum Arabic *Fruit Powders *Encapsulated Oleoresins Powders * Vegetable Fat bases Powders * Caseinates *Caramel Powders * Cheese Powders etc.

ENVIRONMENTAL PRODUCTS (INDIA) PVT. LTD., 160/3, Rajani House, Opp. Don Bosco High School, L.T. Road Borivali (West), Mumbai 400 091. Tel: 801 3601/801 6981, Fax: 91-22-862 1506
Products: * Water Purification *Treatment Plant * Dosers * Filters * Softeners * Polishers *Ozonators * UV System *Reverse Osmosis * Filteration Plants *Chlorinators * Micron Filters * DM/D1 Plants *Clarifiers and Aerators

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Products: * Printed P.P./Polythene Bags * Pouches *Wrappers *Aluminium Foil * Films * Foil Seals * Sealing Machines

EUROTHERM DEL INDIA LTD., Plot No. 152, Developed Plots Estate, Perungadi, Chennai. Tel: 044-4961129, Fax: 044-4961831 Email: info@eurothermdel.com Website: www.eurothermdel.com
Products: ¼ Din Controllers for Atmosphere Heat Treatment * Reliability Test Controller * Composite Curing Autoclaves *

Vacuum Heat Treatment * Glass Furnaces and Forehearths * Pharmaceutical Reactor Vessels * Ceramic and Brick Kilns

FMC ASIA PACIFIC, INC., 2, Bhuvaneshwar Housing Soc. Pashan Road, Pune 411008. Tel: 020-5893700, Fax: 020-5893701, Email: uday_sant@ fmc.com
Products: * Food Processing Machinery * Freezing Equipment * Material Handling Equipment

GANGA SINGH ENGG. PVT. LTD., Unit No.1, Vishal Indl. Estate, Village Road, Bhandup (W), Mumbai 400078. Tel: 91-22-5600562, 5690572, 5645287 (R), Fax: 5649312, Email: ganga@bom4.vsnl.net.in, URL: http://www.gangaengg. com
Products: * Semi Automatic Canning Unit * Can Seaming Machine * Tin Container making Machinery (for Round, Rectangular, Oval, etc. Cans) * Seaming Machine for packing Liquids, Dry Contents and Pesticides * Semi-automatic Seaming Machines * Can Reforming Machines * Can Flanging Machines Power/Hand Operated

GEERLOFS COOLING INDIA PVT. LTD., Old No. 43 / New No. 69, Fourth Avenue, Ashok Nagar, Chennai 600 083. Tel: 044-489 9340/41, Fax: 044-489 9343, Email: geerlofs@grasmd01.vsnl. net.in
Products: * Specialists in setting up Pre-Cool and Cold Store / Freezer Stores / Blast Freezer and I.Q.F for Food & Agro Products * Prefabricated insulated panels (Building material)

GEETA FOOD ENGINEERING, Plot No. C-7/1 TTC Area, Pawana MIDC, Thane Belapur Road, Behind Savita Chemicals Ltd., Navi Mumbai 400 705, Tel: 790 6450, 7906451, 7610907 (R): 7662098, Tel/Fax: 7610907
Products: * Manufacturers of Food Products Equipment & Fabricators

GOLDIN (INDIA) EQUIPMENT PVT. LTD., F/29, B.I.D.C. Industrial Estate, Gorwa, Vadodara 390016, Gujarat. Tel: 91-265-380168, 380461, Fax: 91-265-380168, Email: goldin@icenet.net
Products: * Screen-Air Separators * Destoners * Impact Hullers * Hull Separators * Cleaners & Graders * Air Classifiers * Pneumatic Aspirators * Gravity Separators *Foods * Cleaning & Grading System for Spices, Grain & Seeds * Dehulling and Hull Separation Systems * Pneumatic Conveying System & Dust Collection Plant * Precleaning & Silo Storage Plants (for Soyabean, Groundnut etc.) * Cleaning, Decortication and Oil Mill Plant (for Sunflower, Rapeseed, Groundnut etc.) * Neem Seed Dehulling & Oil Mill Plant * Material Conveying Equipment & Plants * HT/LT-M.C.C. Panel & Installation for whole plant * Complete Turnkey Projects Design, Engineering, Manufacturing Supply and Erection Commisioning

GOMA ENGINEERING PVT. LTD., Majiwada, Behind Universal Petrol Pump, Thane 400601, Mumbai. Tel: 91-22-534 6436, 5340875, Fax: 5333634, Email: goma@vsnl.com.
Products: * Turnkey Dairy Projects * Pasteurizers * High Pressure Homogenisers *Sanitary Pumps * Milk Pumps *Storage Tanks * Ghee Boilers *Cream Separators * Clarifiers *Bulk Coolers *Butter Churn * Ice Cream Plants *Milk Tanks *Cheese Line * Butter Line * Other Dairy Equipment

GURDEEP PACKAGING MACHINES, Harichand Mill Compound, L.B.S. Marg, Vikhroli, Mumbai 400 079. Tel: 5783521, 5772846, Fax: 91-22-5772846 Email: gurdeep_packaging@hotmail.com
Products: Fully Automatic Vertical Form-Fill Seal Machine for Producing Sachet/Pouches from Heat Sealable Laminate

GURU NANAK ENGG. & FOUNDRY WORKS, 166, Industrial Focal Point, Amritsar (Punjab). Tel: 0183-587943, 583542, Fax: 0183-587944
Products: Erectors * Engineers for Modern Rice Plant, Rice Shinning Machine, Rice Grading Plant, De-Stoner & Spare Part of Rice Processing Machinery

H.P. INDUSTRIES, 2, Joaquim Cottage, Vazir Glass Works Road, J.B. Nagar, Opp. Tata Infotech Ltd., Andheri (E), Mumbai 400059. Tele/Fax: 8352505, 8392883, Email: hujone@bol.net.in, Website: www.hpmachines. com
Products: Cup Filling & Sealing Machines * Conveyors * Auto-matic Pickle/Chutney/Jam Filling & Capping Machine * Automatic Monoblock Rinsing, Filling & Capping Machine for Mineral Water * Automatic 3 in 1 Monoblock Machine * Two Head Automatic Powder Filling Machine * Rotary Vacuum Filling Machine * SPM Machine

HARI OM INDUSTRIES, Dhebar Road (South) Atika Industrial Area, St-3 Near Jaydev Foundry, Rajkot 360002. Tel: 363620 (R) 371438, Fax: 0281-371745, Email: hariomind@epatra.com
Products: Food Processing Machinery

HI MEDIA LABORATORIES LTD., A406, Bhaveshwar Plaza, LBS Marg, Mumbai 400 086. Tel: 500 3747 / 0970 , Fax: 500 5764 / 2468 Email: sarojw@giasbm01.vsnl.net.in
Products: * PA Coliform Test Kit (MS1186) Quality Bacte-riological Culture Media * Suppliers of Standardised Lab Chemicals and Biochemicals

HITECH ULTRAVIOLET PVT. LTD., P.O. Box No. 8356, 35, Grace Plaza, 33, S.V. Road, Jogeshwari (W), Mumbai 400102. Tel: 91-22-6790610, 6794611, 6794327, Fax: 91-22-6794337, Email: hitechuv @bom5.vsnl.net.in
Products: * Ultraviolet Water Disinfection Systems * Air Purifiers * Filters * Water Treatment Plants * Bottling Plants

HYDRO AIR RESEARCH (INDIA) PVT. LTD., 203 Malwa, Patanwala Estate, L.B.S. Marg, Ghatkopar (W), Mumbai 400086. Tel: 5003400, Fax: 022-5001358, Email: har@vsnl.com
Products: * Membrane Technology * Process Application *Effluent Treatment * Membrane Bioreactor

INDU ASSOCIATES, B-10, Shilp-Sangeet, L.T. Road, Borivali (W), Mumbai 400091. Tel: 8010894, 8017943, Fax: 8010894
Products: * S. S. Valves (Ball Valves, 3-Way Plug Valves, Butterfly, Non-Return Diaphragm Valves, Sight Glass, Flow Regulating, Pneumatic Valves) * Pumps * Fittings (Unions, Bends, Tees, Reducer, Triclover Clamps, Pipe Holders) * End-connections (IDF, SMS, DIN, Triclover, BSP, NPT, FLANGED) * Filters (Micron, Conical) *Tanks & Equipment (S. S. Tank, Filter Press) * Site Jobs (Electro Polishing, Pipeline Erection & Argon-arc Welding)

INDUSTRIAL REFRIGERATION PVT. LTD., 901, Maker Chambers V_1 Nariman Point, Mumbai 400 021. Tel: 204 1183 / 85, Fax: (91-22) 2044944, Email: allstate@123 india. com
Products: * Cold Storage Plants / Equipment * Fish Processing Plant * Freezers * Fruit / Vegetable Processing Machinery / Plant * Ice Making Machinery * Refrigeration Plant & Equipment

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J.K. MALT PRODUCTS PVT. LTD., 61, GIDC Estate, Nadiad - 387001, Gujarat. Tel: 62691-95, Fax: 62696-97 Email:jkmalt@icenet. net
Products: Malt Extracts IP (Liquid & Powder)

JAY CHEM MARKETING, B/5, 3rd Flr, Nemi Krishna Soc., V.L. Rd., Kandivali (West), Mumbai - 400 067. Tel. Nos: (022) 8020141 / 8061337, Fax No: (022) 8061337 Email: jaychem @bom3.vsnl.net.in
Products: Aspartame * Acesulfame K. * Calcium Propionate * Carrageenan * Enzymes * Glucono Delta Lactone * Glyceryl Mono Stearate (GMS) * Mono Sodium Glutamate * Pectin * Potassium Sorbate * Preservatives *Sodium Benzoate * Sodium Citrate * Sorbic Acid * Sweeteners * Xanthan Gum

JANAK DEHYDRATION PVT. LTD., P.B. 58, Keri Bazar, Old Darbargadh, Mahuva 364290 (Dist. Bhavnagar), Gujarat. Tel: 02844-27763/64/65, Fax: 02844-24265
Mumbai Mktg. Off.: Tel: 8074436/ 8061113, Fax: 022-8612735 Email: jkmehta@bom5.vsnl.net.in
Products: * Dehydrated Vegetable Products such as Onion, Garlic, etc. Also free flowing Powders of dehydrated Onion and Garlic

JET PACK MACHINES, C-18, Nandjyot Industrial Estate, Safed Pool, Kurla-Andheri Road, Sakinaka, Mumbai 400072. Tel: 91-22-8516489, 8515561, Fax: 8516489, Email: jetpack@vsnl.com
Products: * Packaging Machines such as* Powder Filling Machines * Cream /Paste Filling Machines * Liquid Filling Machines * Horizontal Flow Wrapping Machine * Granules Filling Machine * Capping Machines * Batch Coding Machines * Neck Sleeving Machine * Insert Sealing Machines *Aluminium Foil Sealing Machines *Carton Overwrapping Machines

JWALA ENGINEERING COMPANY, 12, Survey Industrial Estate, Sonawala Cross Rd., No.1, Goregaon (E), Mumbai 400-063. Tel: 91-22-8740279, Fax: 8768768
Products: * Fruit & Vegetable Processing & Packaging Machinery such as * Fruit & Vegetable Preparatory, Processing & Canning Equipment * Fruit Juice Concentration Equipment * Mushroom Processing & Canning Line * Peas Preparatory & Processing Line * Potato Chips Line * Fruit Procesing Plant * Pulp Concentration Plant * Automatic Filling and Packaging Machinery & Plant * Material Handling Systems * Bottling Line * Turnkey Projects * Custombuilt Equipment

K. RAHEJA MERCANTILE CORPORATION., 108, New India Indl. Estate, Off Mahakali Caves Road, Andheri (E), Mumbai 400093. Tel: 8382032/1529/8394665/4666, Fax: 8363458, Email: sales@krahejacontainers. com, Website: http://www.kraheja containers.com
Products: * Thin Walled Plastic Containers

KAIZEN ENTERPRISES, A/5, Trupti, G.V. Scheme Road #4, Mulund (E), Mumbai -400081. Tel: 5646873, Fax: 5646873, Email: kaizen@zeenext.com
Products: * Semi-Automatic Weigh-Fill Machine

KAPOOR INTERNATIONAL, Vishnu Industrial Estate, Unit No 23, Masrani Lane, Halao Pool Road, Kurla (W), Bombay - 400070. Tel: 5142594, 5168891, Fax: 91-22-6501878, Email: shrinkwr@bom5.vsnl.net.in
Products: * Conveyor Machinery for Drying, Ovens and Tray Dryers * Shrink Wrapping Machines * Plate making machines * Infrured Quartz Heating Systems * Drying Machinery * L- Sealer Machines

KUSHALCHAND SONS, Devkaran Mansion, Block 1, 2nd Floor, Princess Street, Mumbai - 400002. Tel: 2052190/2080937/ 2090784, Fax: 91-22-2084265 Email: ksons@bom3.vsnl.net.in
Products: Vanillin * Pectin * Yeast Extracts * Xanthan Gum * Ethyl Vaniliu * Hydrolysed vegetable Protein (Hup)

KOMAL INDUSTRIES, 108 Creative Ind. Centre, 12 N.M. Joshi Marg, Lower Parel, Mumbai 400011. Tel: 91-22-3091090, 3091174, Fax: 3062711, Email: kcc@giasbm01.vsnl.net.in
Products: * Water Treatment Plant * Water Demi-neralisation Plant * Mineral Water * U.V. Disinfector * Drinking Water System * Micron Filter * Ozoriator * Water Softening Plant * Reverse Osmosis Systems *Water Filteration Plant * Water Purifier * Dosing System

KOTHARI PHARMA, C-11, M.K. Brothers Ind. Estate, Jarimari, Andheri-Kurla Road, Andheri (E), Mumbai 400072. Tel: 8510837/ 2794, Fax: 8513584/8389961 Email: chandrakant@kothari pharma. com, Website: www. kothari pharma.com
Products: "Precikot" Pharma Machineries * Fluid Bed Dryer * Filter Press * Multicolumn Distillation Plant *Rotary Bottle Washing Machine

KOVITINS, 21, Nandlal Ramroop Estate, Ram-krishna Mandir Road, Andheri (E), Mumbai 400059. Tel/ Fax: 8230095
Products: Bakery Equipment such as * Modular Deck Ovens * Convection Ovens * Planetary Mixers * Dough Mixers * Bread Slicers etc.

KUMAR PROCESS CONSULTANTS & CHEMICALS PVT. LTD., 230/4, Ashoka House, Behind Sheetal Arch, Linking Road, Bandra (W), Mumbai 400050. Tel: 91-22-6451964, 6432512, 6420637, Fax: 91-22-6432512, 6420637, 6451964, E-mail: kumarfil@bom3.vsnl.net.in
Products: * Polishing Filters for Solvents, Aqueous Solutions, Injectables * Membrane Holders in SS316 Incorporating Unbreakable Regenerable SS316 Filter Media * Liquid Filters upto 0.1 Micron * Air Filters upto 0.01 Micron * In-Line Conical Filters from 100 upto 0.2 Micron *Stainless Steel Lab Filters * Filter Cartridges & Discs * Filter Housings

LAB INSTRUMENTS, 9, Ratnadeep, 78-B, Jagannath Sankar Seth Road, Mumbai 400004. Tel: 3690973, 3681316, Fax: 3690973
Products: * Laboratory Equipment & Appliances for Research e.g. * Spectro-photometer * Electronic Balances * Ion Analyser *Tintometer * Brook Field Viscometer * Centrifuge *pH Meter *Conductivity Meter *Polarimeter *Refractometer *Stirrers * Emulsifiers * Hot Air Ovens * Heating Mantles * Filter Paper * Borosil Glassware *B.O.D. Incubator *Water Bottle *Moisture Meter

LACTOCHEM LIMITED, No.52, Jawaharlal Nehru Road, Ekkattuthangal, Chennai 600 097. Tel: 044-2345881, 2345882, 2340026, Fax: 044-2345884, 2340104, Email: marketing@malladiinc.com
materials@malladiinc.com
lactochem@usa.net
Products: Natural Grade * L(+) Lactic Acid - Food Grade (ISI Marked) * Calcium Lactate * Sodium Lactate * Buffered Lactic Acid - Confectionery Grade

LALJEE GODHOO & CO, 213, Samuel Street, Mumbai - 400 003. Tel: 91-22-3421379/3445812. Fax: 91-22-340 1742. Email: lgco@bom3 vsnl.net. in
Products: Compounded Asafoetida (Hing)

LITHOTECH ENGINEERS, Sector 10, B-25, S-2 Shantinagar, Mira Road (E), Thane 401107. Tel: 8110182/3648/3617, Fax: 91-22-8105808, Email: lithotech@vsnl.com
Products: * Masala Mill - Grinding * Chillies * Turmeric * Coriander * Mix Masala * Dehydrated Onions * Garlic * Ayurvedic * Other products

LUCAS ELECTRONICS, B2/5, Mapkhan Nagar, Near fire Brigade, Marol Naka, Andheri (E), Mumbai 400059. Tel: 821 3660, Telefax: 8501265, Email: lucasg@bom2.vsnl.net.in
Products: * Continuous Sealer Machine with gas flushing m/c * Shrink Wrapping Machine * Cap Sealer Machine * Vacuum + Nitrogen Flushing Machine * Motorised Pepsi Sealer Machine * Mineral Water Pouch Sealingm/c

M. K. MANUFACTURING COMPANY, Bhatia Glass Compound, Vakola Pipeline, Santacruz (E), Mumbai 400055. Tel: 6100219, 6130388, Fax: 6187365
Products: * Engineers & Process Designers * Fluid Bed Dryer *Spray Drying Plant * Salt Upgrading Plant * Rotary Automizer, Rotary Air Lock, Roller Crusher, Sieving Machine, Wet Mill, Bucket Elevator, Vibro Feeder, Conveying System & Processing Equipment.

M.M.M. BUXABHOY & CO., 141-A, Sarang Street, 1st Floor, Near Crawford Market, Mumbai 400003. Tel: 91-22-3442902, 3452532, Fax: 91-22-3425230, Email: yusufs@vsnl.com
Products: * Popcorn Machine * Espresso Coffee Machine * Aerated Water Machines * Manual Heat Sealing Machines * Pilfer Proof (P.P.) Cap Sealing & Threading Machines * Three in One Potato Wafer Machines

MAGUMPS, Trisandhya 'A' Bldg., 97, Dadasaheb Phalke Rd., Dadar (E), Mumbai 400014. Tel: 4113572, 4154474, Fax: 91-22-4137648, 4138307, Email: magumps@bom5.vsnl.net.in
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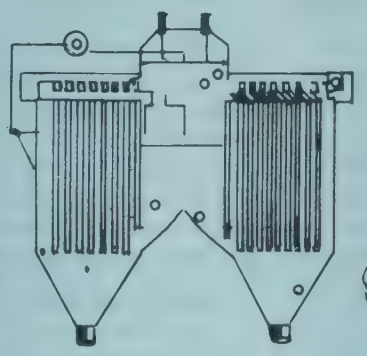
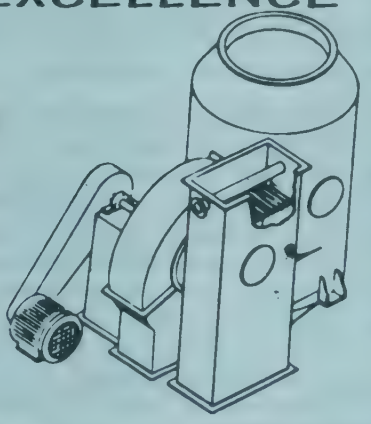
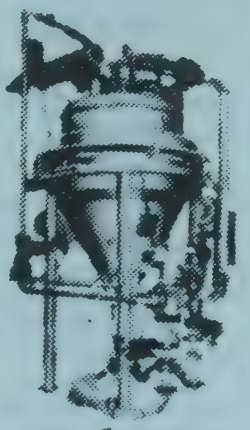

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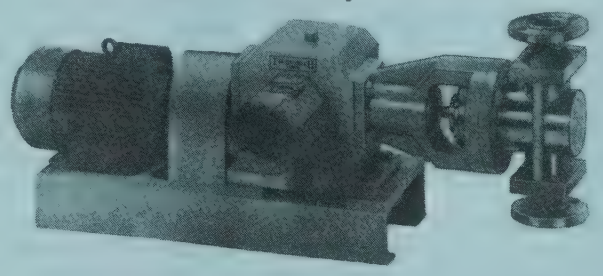

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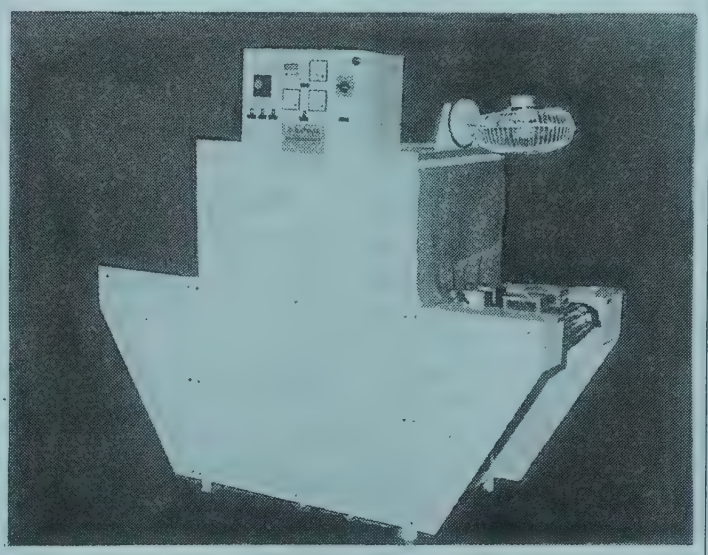

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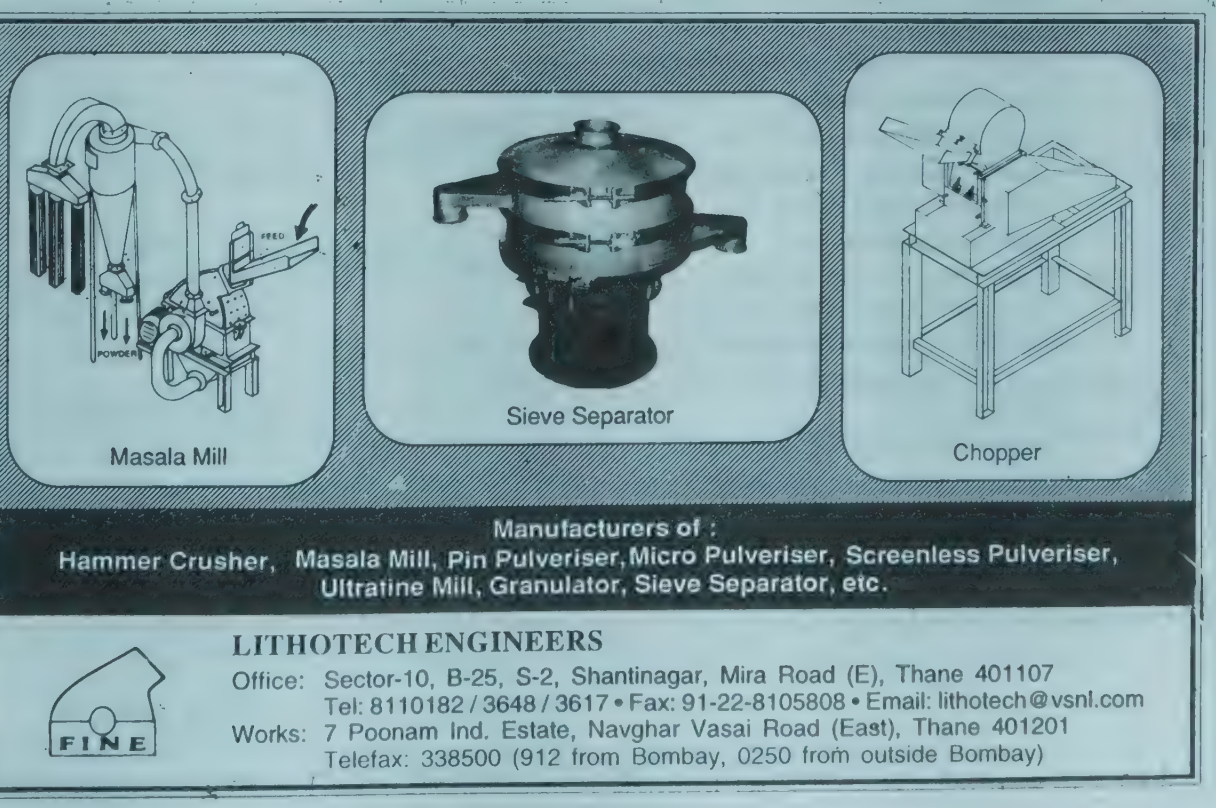
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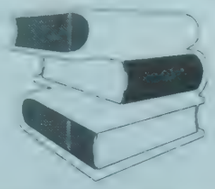

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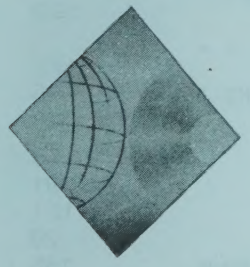

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